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| **Course Code** | **14FP2001/18FP2001/17FP2001** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF FOOD PROCESS ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Calculate the resultant force for a body of 3 kg mass and an acceleration of 4 m/s2 . | | CO1 | R | 1 |
| 2. | Differentiate primary and secondary dimension with an example. | | CO1 | U | 1 |
| 3. | Recall the significance of dew point temperature. | | CO2 | R | 1 |
| 4. | Construct Amagat’s law with a neat diagram. | | CO2 | A | 1 |
| 5. | Express the Bernoulli’s equation. | | CO3 | U | 1 |
| 6. | Relate specific volume and mass density. | | CO3 | U | 1 |
| 7. | Paraphrase Tie & Basis Materials. | | CO4 | R | 1 |
| 8. | Reproduce the mass balance for a steady-state single effect evaporator. | | CO4 | R | 1 |
| 9. | Cite an equation for the rate of heat addition to a process where the temperature changes from T1 to T2 . | | CO5 | U | 1 |
| 10. | Rewrite the SI unit of specific heat capacity. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Compare the terms molality, molarity and normality. | | CO1 | U | 3 |
| 12. | A cylinder of 120 L contains CO2 at 100 bar and at 20 ºC. Determine the following:  1) Mass of the gas.  2) Molar volume of the gas  3) Density of the gas | | CO2 | A | 3 |
| 13. | Explain the concept of surface tension with suitable example. | | CO3 | U | 3 |
| 14. | Orange juice concentrate is made by concentrating single-strength juice to 65% solids followed by dilution of the concentrate to 45% solids using single-strength juice. Draw a diagram for the system and set up mass balances for the whole system and for as many subsystems as possible. | | CO4 | An | 3 |
| 15. | Differentiate sensible and latent heat capacities. | | CO5 | U | 3 |
| 16. | Examine the functions of a heat exchanger. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Paraphrase the following physical quantities.  i) Force ii) Pressure iii) Energy iv) Heat v) Work | CO1 | U | 8 |
|  | b. | The weight of an object is 300 N at a location where acceleration due to gravity is 9.81 m/s2.  i) Determine the mass of the object in kilograms  ii) Express the mass in FPS system | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Atmospheric air at 760mm of Hg has 45ºC dry bulb temperature and 30 ºC wet bulb temperature. Solve the following using psychometric chart. i) Relative humidity ii) Humidity Ratio iii) Dew Point Temperature iv) Enthalpy v) Specific Volume of Air | CO2 | A | 6 |
|  | b. | Deduce an expression for ideal gas equation. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the working principle of any two-fluid flow measuring devices. | CO3 | U | 8 |
|  | b. | The diameters of a pipe at the sections 1 and 2 are 10 cm and 15 cm, respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also the velocity at section 2. | CO3 | A | 4 |
|  |  |  |  |  |  |
| 20. | a. | Establish the mass balance for a solvent extraction process with a neat diagram. | CO4 | A | 6 |
|  | b. | How much weight reduction would result when a material is dried from 80% moisture to 50% moisture? | CO4 | E | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss briefly about the heat capacities of solids, liquids and gases. | CO5 | U | 6 |
|  | b. | Calculate the amount of steam at 121.1◦C that must be added to 100 kg of a food product with a specific heat of 3559 J/(kg K) to heat the product from 4.44◦C to 82.2◦C by direct steam injection.  Given data: hg at 121◦C = 2.70705 MJ/kg; hf at 82.2◦C = 0.34417 MJ/kg | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Illustrate the material balance for Evaporation process in single effect and triple effect evaporators. An evaporator has a rated evaporation capacity of 500 kg water/h. Deduce the rate of production of juice concentrate containing 45% total solids from raw juice containing 12% solids. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | 1000 kg of mixed acid of composition 40% H2SO4, 45% HNO3, and 15% H20 is to be produced by strengthening waste acid of composition 30% H2SO4, 36% HNO3, and 34% H20 by weight. Concentrated sulphuric acid of strength 95% and concentrated nitric acid containing 80% are available for this purpose. How many kilograms of spent acid and concentrated acids are mixed together? | CO4 | E | 8 |
|  | b. | Derive a continuity equation for fluid flowing through pipes. | CO3 | An | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Steam is used for peeling potatoes in a semi-continuous operation. Steam is supplied at the rate of 4 kg per 100 kg of unpeeled potatoes. The unpeeled potatoes enter the system with a temperature of 17°C, and the peeled potatoes leave at 35°C. A waste stream from the system leaves at 60°C. The specific heats of unpeeled potatoes, waste stream, and peeled potatoes are 3.7, 4.2, and 3.5 kJ/(kg K), respectively. If the heat content (assuming 0°C reference temperature) of the steam is 2750 kJ/kg, determine the quantities of the waste stream and the peeled potatoes from the process. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Enumerate the units and dimensions of various physical quantities. |
| CO2 | Express the laws and theory of gases and vapours. |
| CO3 | Describe the types and properties of fluid flow. |
| CO4 | Calculate the material balance in food processing units. |
| CO5 | Appraise the performance of processing units. |
| CO6 | Validate the energy balance involved in food processing operations. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 12 | 4 | - | - | - | 17 |
| CO2 | 1 | - | 10 | 6 | - | - | 17 |
| CO3 | - | 13 | 4 | 4 | - | - | 21 |
| CO4 | 2 | 12 | 6 | 3 | 14 | - | 37 |
| CO5 | 1 | 10 | 6 | - | - | - | 17 |
| CO6 | - | - | 15 | - | - | - | 15 |
|  | | | | | | | **124** |



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| **Course Code** | **14FP2018/18FP2021/17FP2021** | **Duration** | **3hrs** |
| **Course Name** | **FOOD SAFETY REGULATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | As per FSS, 2006 ………………….. shall constitute the scientific committee. | | CO1 | R | 1 |
| 2. | Point out the legislation enacted by GoI as a central legislation in the year 1955 to control production, supply and distribution, trade and commerce of certain commodities. | | CO1 | An | 1 |
| 3. | The codex alimentarius establishes ……………… levels for residues of veterinary drugs in foods. | | CO3 | R | 1 |
| 4. | In case a country is not yet member of the Codex commission, under what capacity do they have the rights to attend deliberations of the commission? | | CO1 | U | 1 |
| 5. | Identify part I and III of the protocol of provisional application of GATT. | | CO3 | R | 1 |
| 6. | In case the central government is of the opinion that it is necessary to control the hoarding of any foodstuff and issues a notification to that effect, indicate how the average market rate is calculated. | | CO3 | An | 1 |
| 7. | ………………. is a measure of how far a given process deviates from perfection. | | CO4 | R | 1 |
| 8. | In USA, ………………… refused to regulate distinctive labelling where GM foods are substantially equivalent to their non-GM versions. | | CO4 | U | 1 |
| 9. | …………..is the system on which the 7 principles of HACCP were developed. | | CO6 | U | 1 |
| 10. | IS………….. is the BIS standard for packaged mineral water. | | CO2 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | State the basis for removal of any member of FSSAI from his office without giving him/her an opportunity to be heard. | | CO1 | R | 3 |
| 12. | Shree Charsobeez was caught in possession of a plate that is used for the purpose of counterfeiting grade designation mark that has not been authorized by AGMARK. Point out the imprisonment term and fine levied upon him for the above mentioned infraction. | | CO5 | An | 3 |
| 13. | List the issues that are not covered under the labelling regulation 1139/98 for GMO foods. | | CO2 | R | 3 |
| 14. | State the 4 types of nutritional and health claims that are permitted in Code of Belgium under the Conduct on Health Claims by FEVIA. | | CO2 | R | 3 |
| 15. | Point out any 3 optional members of a HACCP multi-disciplinary team. | | CO6 | An | 3 |
| 16. | Recall reasons why inspection of water bottling companies are permitted under Section 704 of FDCA. | | CO4 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Breakdown the subtitles that are to be defined while drafting commodity standards as per the Procedural Manual of the Codex Alimentarius Commission. | CO1 | An | 8 |
|  | b. | List any 4 agreements signed under World Trade Organization. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 18. | a. | Discuss any 4 functions of the CEO of Food Authority of India. | CO2 | U | 4 |
|  | b. | Present the importance of “Due Diligence” from a manufactures point of view. | CO2 | A | 2 |
|  | c. | Explain the functions of Central Advisory Committee. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Express the functions of World Trade Organization. | CO1 | U | 8 |
|  | b. | Design a flow chart depicting the timeline between a draft TBT measure and a permanent TBT standard. | CO5 | C | 4 |
|  |  |  |  |  |  |
| 20. | a. | Paraphrase the manufacturer’s need that a legislature should be mindful of while developing Legislation for food labelling. | CO2 | U | 8 |
|  | b. | Recall the procedure to be followed by FBOs (food business operators) to obtain FSSAI license and registration. | CO2 | R | 4 |
|  |  |  |  |  |  |
| 21. | a. | Predict the consumer’s needs to be followed by manufactures while designing labels for the UK market. | CO4 | E | 7 |
|  | b. | Restate the functions and Responsibilities of ICGFI. | CO1 | R | 5 |
|  |  |  |  |  |  |
| 22. | a. | Describe how the 7 principles of HACCP are enacted in practice. | CO6 | U | 8 |
|  | b. | Distinguish between the functions of Scientific Panel and Scientific Committees of the Food Safety Standards Authority of India. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the application of ISO22000 Food Safety Management system to a bovine fatling processing line. | CO5 | A | 6 |
|  | b. | Summarize the 3 approaches used for planning HACCP Projects, with relevant examples for each process. | CO6 | E | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the contaminants found in Drinking Water as per WHO. | CO5 | U | 8 |
|  | b. | Breakdown the requirements of IS 14543. | CO4 | An | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the regulations followed in various food industries. |
| CO2 | Define the food labeling patterns. |
| CO3 | Apply the knowledge in food industries. |
| CO4 | Analyze the safety operations involved in food systems. |
| CO5 | Evaluate the steps involved in the process operations in food industries. |
| CO6 | Prepare HACCP standards for food industries. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 13 | 9 | - | 13 | - | - | 35 |
| CO2 | 11 | 12 | 2 | 6 | - | - | 31 |
| CO3 | 2 | - | - | 1 | - | - | 3 |
| CO4 | 4 | 1 | - | 4 | 7 | - | 16 |
| CO5 | - | 8 | 6 | 3 | - | 4 | 21 |
| CO6 | - | 9 | - | 3 | 6 | - | 18 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **18FP2017** | **Duration** | **3hrs** |
| **Course Name** | **REFRIGERATION, AIR CONDITIONING AND COLD STORAGE CONSTRUCTION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define COP in a refrigeration system. | | CO1 | R | 1 |
| 2. | Define “bubble point” in relation to refrigerants. | | CO1 | R | 1 |
| 3. | Define “tier” in a stacking system. | | CO2 | R | 1 |
| 4. | Name any two insulation materials used in cold storages. | | CO1 | R | 1 |
| 5. | Explain “Dalton’s law” of partial pressure. | | CO2 | U | 1 |
| 6. | Classify cold storage based on operating temperature. | | CO1 | U | 1 |
| 7. | Explain the mechanism behind the preservation of foods by freezing. | | CO3 | An | 1 |
| 8. | Discuss the applications of IQF. | | CO1 | U | 1 |
| 9. | Mention the optimum temperature range for survival of *Psychrophiles*. | | CO2 | R | 1 |
| 10. | Mention an example of rapid freezer. | | CO3 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List any 4 secondary refrigerants and explain the properties of any two. | | CO1 | R | 3 |
| 12. | Appraise the general requirements in a refrigerated transport. | | CO2 | An | 3 |
| 13. | Examine any 3 requirements of packaging in chilled foods. | | CO4 | R | 3 |
| 14. | Mention the advantages of using food cryogens. | | CO1 | A | 3 |
| 15. | Differentiate between minimum, optimum and maximum growth temperature for microorganisms. | | CO2 | An | 3 |
| 16. | Mention any 3 factors that affect Modified Atmospheric Packaging in frozen foods. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Explain the controls used in a refrigeration system. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Justify the raking system in a bulk storage in food processing plants. | CO2 | E | 8 |
|  | b. | Explain the acceptance test performed in the manufacture of cooling towers. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 19. | a. | Explain the adiabatic humidification of air using psychrometric chart. | CO1 | A | 8 |
|  | b. | An ambient air at 40℃ dbt and 30 % RH is cooled 25℃ dbt and 21℃ wbt by a cooling coil maintained at 20℃. The flow rate of the air is 10 m3/min. Find the capacity of the cooling coil in ton and the by-pass factor of the coil. Use psychrometric chart for the properties of air. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Assume that you are a process engineer in a freezing plant. How would you apply IQF for chives? Discuss the process with a flowchart. | CO3 | U | 8 |
|  | b. | With a neat sketch explain the liquid nitrogen freezers. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 21. | a. | Food with an initial moisture content of 400 % (dry-weight basis) is poured into 0.5 cm layers in a tray placed in a freeze drier operating at 40 Pa. It is to be dried to 8 % moisture (dry-weight basis) at a maximum surface temperature of 55℃. Assuming that the pressure at the ice front remains constant at 78 Pa, calculate (a) the drying time and (b) the drying time if the layer of food is increased to 0.9 cm and dried under similar conditions.  (Additional data: the dried food has a thermal conductivity of 0.03 W m-1K-1, a density of 470 kg m-3, a permeability of 2.4 x 10-8 kg s-1 and the latent heat of sublimation is 2.95 x 103 kJ kg-1) | CO3 | An | 8 |
|  | b. | Anticipate the usage of small delivery vehicles in cold chain management in food distribution sector. | CO5 | C | 4 |
|  |  |  |  |  |  |
| 22. |  | Evaluate the various packaging materials used for chilled foods. | CO6 | E | 12 |
|  |  |  |  |  |  |
| 23. | a. | Describe the *Baudelot* type surface cooler in the chilling of carbonated drinks with a NEAT diagram. | CO4 | An | 6 |
|  | b. | Appraise the advantages of using aluminum, paper and glass as packaging materials for chilled foods. | CO6 | E | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Anticipate the various design and operational factors affecting temperature uniformity during transport or logistics. | CO2 | C | 6 |
|  | b. | Discuss the protocols and functioning of vessel sea transport and logistics for frozen food products. | CO2 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand refrigeration of food and its operational components. |
| CO2 | Gain knowledge on various forms of food refrigeration in plants, stores and logistics. |
| CO3 | Learn advanced food freezing concepts and techniques. |
| CO4 | Study food safety aspects of chilled foods and frozen foods. |
| CO5 | Comprehend cold chain management in food distribution sector. |
| CO6 | Evaluate the cold storage and packaging of frozen perishable products. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 6 | 2 | 15 | 16 | - | - | 39 |
| CO2 | 2 | 7 | - | 6 | 8 | 6 | 29 |
| CO3 | 1 | 8 | - | 13 | - | - | 22 |
| CO4 | 3 | - |  | 6 | - | - | 9 |
| CO5 | - | - | - | - | - | 4 | 4 |
| CO6 | 3 | - | - | - | 18 | - | 21 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18FP2017** | **Duration** | **3hrs** |
| **Course Name** | **REFRIGERATION, AIR CONDITIONING AND COLD STORAGE CONSTRUCTION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Examine the function of shut off valve as an operation component in refrigeration and cold storage. | | CO1 | A | 1 |
| 2. | Define “Net refrigeration effect”. | | CO1 | R | 1 |
| 3. | Define “stow” in a stacking system. | | CO1 | R | 1 |
| 4. | State the dimension of “Euro pallet” | | CO1 | R | 1 |
| 5. | Express the “total heat load” with an equation. | | CO1 | U | 1 |
| 6. | Express the Fourier law of heat conduction. | | CO1 | U | 1 |
| 7. | Define IQF. | | CO3 | R | 1 |
| 8. | Recall the commonly used food cryogens. | | CO3 | R | 1 |
| 9. | Associate the major disadvantage of using food cryogens. | | CO3 | U | 1 |
| 10. | Express the category to which still air freezers and cold stores belong. | | CO3 | C | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the four basic processes in a vapor compression refrigeration system. | | CO1 | R | 3 |
| 12. | Anticipate the working of “Intermodal Freight Containers” in logistics. | | CO2 | C | 3 |
| 13. | Differentiate between design bid and design build types in project development. | | CO2 | An | 3 |
| 14. | List the commercially frozen foods. | | CO4 | R | 3 |
| 15. | List the criteria for selection of refrigerated cabinets to display food. | | CO5 | R | 3 |
| 16. | Articulate the mechanism behind food spoilage. | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Analyze the water-ammonia type of vapor absorption system. | CO1 | An | 8 |
|  | b. | Assess the basic operational components of vapor compression refrigeration system. | CO1 | E | 4 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the insulating materials and their properties used in cold storages. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Classify and explain the different air conditioning systems. | CO2 | An | 8 |
|  | b. | Generalize moisture transfer in building system while designing air conditioning systems. | CO2 | C | 4 |
|  |  |  |  |  |  |
| 20. | a. | Evaluate the different components of freezing curve. | CO3 | E | 8 |
|  | b. | Distinguish between effective and nominal freezing time. | CO3 | E | 4 |
|  |  |  |  |  |  |
| 21. | a. | Explain the effect of crystal size on texture and quality of foods during freezing. | CO3 | A | 6 |
|  | b. | Five-centimeter potato cubes are individually quick frozen (IQF) in a blast freezer operating at -40℃ and with a surface heat transfer coefficient of 30 Wm-2K-1. If the freezing point of the potato is measured as -1.0℃ and the density is 1180 kg m-3, calculate the expected freezing time for each cube. If the cubes are then packed into a cardboard carton measuring 20 cm x 10 cm x 10 cm, calculate the freezing time. Also calculate the freezing time for IQF freezing of 2.5 cm cubes.  (Additional data: the thickness of the card is 1.5 mm, the thermal conductivity of the card is 0.07 Wm-1K-1, the conductivity of potato is 2.5 W m-1 K-1 and the latent heat of crystallization 2.74 x 105 J kg-1. | CO6 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the different types of freezers used for storage of foods. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Anticipate the various types of cabinets used in refrigerated display. | CO5 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the recommendations that apply to transport of frozen products by air logistics. | CO2 | U | 6 |
|  | b. | Explain the different types of traceability in cold chain management in food distribution sector. | CO5 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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| --- | --- |
|  | **COURSE OUTCOMES** |
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| CO4 | Study food safety aspects of chilled foods and frozen foods. |
| CO5 | Comprehend cold chain management in food distribution sector. |
| CO6 | Evaluate the cold storage and packaging of frozen perishable products. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 6 | 14 | 1 | 8 | 4 | - | 33 |
| CO2 | - | 6 | - | 11 | - | 7 | 24 |
| CO3 | 2 | 1 | 18 | - | 12 | 1 | 34 |
| CO4 | 3 | - | - | - | - | - | 3 |
| CO5 | 3 | - | 3 | 6 | - | 12 | 24 |
| CO6 | - | - | - | 6 | - | - | 6 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **18FP2019** | **Duration** | **3hrs** |
| **Course Name** | **CEREALS AND PULSES PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the aim of pre-cleaning paddy. | | CO2 | R | 1 |
| 2. | State the bed depth in thin layer drying. | | CO2 | R | 1 |
| 3. | Name the enzyme in rice bran oil that is responsible for its spoilage. | | CO3 | R | 1 |
| 4. | Define head rice. | | CO2 | R | 1 |
| 5. | List the various types of whitening cones. | | CO2 | R | 1 |
| 6. | Assess the steps in parboiling of wheat. | | CO2 | E | 1 |
| 7. | Define hominy feed. | | CO3 | R | 1 |
| 8. | Define bolting. | | CO2 | R | 1 |
| 9. | Identify the popular varieties of popcorn. | | CO3 | U | 1 |
| 10. | Define nixtamalization. | | CO3 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | With a NEAT sketch appraise the structure and composition of paddy. | | CO1 | E | 3 |
| 12. | Appraise the process of glazing in rice. | | CO2 | An | 3 |
| 13. | Differentiate between strong and weak wheats. | | CO1 | An | 3 |
| 14. | Examine ANY THREE corn products with their applications. | | CO4 | A | 3 |
| 15. | Discuss the various advantages and disadvantages of wet popping of corn. | | CO4 | U | 3 |
| 16. | Enlist the various factors affecting the pulse milling outturn. | | CO5 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Anticipate the principle and working of LSU dryer with a NEAT sketch. | CO2 | C | 6 |
|  | b. | Assess the effect of parboiling on milling, cooking and nutritional quality of paddy rice. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 18. | a. | Enlist the different methods of paddy parboiling and explain ANY TWO in detail. | CO2 | R | 6 |
|  | b. | Explain with a flowchart the manufacturing process of puffed rice. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the construction and working of under runner disc sheller. | CO2 | A | 6 |
|  | b. | Describe ANY FOUR processes to produce quick cooking rice. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the chemical lye peeling process of parboiling in wheat. | CO2 | A | 6 |
|  | b. | Explain ANY TWO products and by-products of wheat. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the feed/food and industrial uses of corn wet milling products. | CO6 | An | 6 |
|  | b. | Explain the Tempering-degerming method of maize dry milling. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the steps in maize flour processing with a suitable flowchart. | CO4 | An | 6 |
|  | b. | Examine the primary products of maize milling. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Assess the industrial production of tortillas from fresh masa. | CO4 | E | 6 |
|  | b. | Discuss the CMR technology with its benefits. | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the important unit operations of pulse milling. | CO5 | U | 6 |
|  | b. | Explain the CIAE method of pulse milling. | CO5 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge about the basic composition and structural parts of food grains. |
| CO2 | Know about paddy processing and rice milling equipment which will help them for developing entrepreneurial skills. |
| CO3 | Apply the knowledge to process food grains into value added products. |
| CO4 | Acquire the skills of processing wheat, maize and corn. |
| CO5 | Develop skills needed in the milling of pulses. |
| CO6 | Study the processing and milling of maize which will promote gainful employment. |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  |  | 3 | 3 |  | 6 |
| CO2 | 11 |  |  | 3 | 7 | 6 | 27 |
| CO3 | 9 | 7 |  | 12 | 6 |  | 34 |
| CO4 |  | 9 | 3 | 6 | 6 |  | 24 |
| CO5 | 3 | 6 | 6 |  |  |  | 15 |
| CO6 |  |  | 12 | 6 |  |  | 18 |
|  | | | | | | | **124** |

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**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18FP2019** | **Duration** | **3hrs** |
| **Course Name** | **CEREALS AND PULSES PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define parboiling. | | CO2 | R | 1 |
| 2. | Discuss the aims of cleaning in paddy processing. | | CO2 | U | 1 |
| 3. | Recall the different types of whitening cones. | | CO2 | R | 1 |
| 4. | Recall glazing. | | CO2 | R | 1 |
| 5. | Describe bulgar. | | CO2 | U | 1 |
| 6. | Define semolina. | | CO3 | R | 1 |
| 7. | Define hominy feed. | | CO3 | R | 1 |
| 8. | Examine ANY ONE food/feed and industrial use of starch. | | CO3 | A | 1 |
| 9. | Recall the popular varieties of popcorn. | | CO4 | R | 1 |
| 10. | Define nixtamalization. | | CO4 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain the advantages and disadvantages of parboiling. | | CO2 | U | 3 |
| 12. | Describe the various principles of cleaning. | | CO2 | U | 3 |
| 13. | Assess the process of noodles making with a flowchart. | | CO3 | E | 3 |
| 14. | Explain ANY THREE maize products. | | CO4 | A | 3 |
| 15. | Examine the dry and wet method of popping of maize. | | CO4 | A | 3 |
| 16. | Appraise the production of maltodextrins. | | CO3 | E | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss in detail the structure and composition of paddy with a NEAT sketch. | CO1 | U | 6 |
|  | b. | Express the CFTRI method of parboiling in paddy. | CO2 | C | 6 |
|  |  |  |  |  |  |
| 18. | a. | Assess the principle and working of LSU dryer. | CO2 | E | 6 |
|  | b. | Analyze with a flowchart the process of puffing paddy. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Analyze the principle and working of under runner disc sheller. | CO2 | An | 6 |
|  | b. | Analyze ANY THREE methods of quick cooking rice. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 20. | a. | Recall the structure and composition of wheat with a NEAT sketch. | CO1 | R | 6 |
|  | b. | Explain the pre-heat treatment process of bulger production. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Summarize the process of corn dry milling. | CO3 | E | 6 |
|  | b. | Anticipate the various steps in maize flour processing. | CO3 | C | 6 |
|  |  |  |  |  |  |
| 22. | a. | Appraise the industrial production of tortillas from fresh masa. | CO3 | E | 6 |
|  | b. | Explain the benefits of CMR technology. | CO6 | An | 6 |
|  |  |  |  |  |  |
| 23. | a. | Examine the various steps in refining of corn oil. | CO4 | A | 6 |
|  | b. | Explain the drawbacks of solvent extraction process. | CO6 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Justify the important unit operations of pulse milling. | CO5 | E | 6 |
|  | b. | Assess the dry milling method in pulse milling. | CO5 | E | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge about the basic composition and structural parts of food grains. |
| CO2 | Know about paddy processing and rice milling equipment which will help them for developing entrepreneurial skills. |
| CO3 | Apply the knowledge to process food grains into value added products. |
| CO4 | Acquire the skills of processing wheat, maize and corn |
| CO5 | Develop skills needed in the milling of pulses. |
| CO6 | Study the processing and milling of maize which will promote gainful employment |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 6 | 6 | - | - | - | - | 12 |
| CO2 | 3 | 8 | - | 18 | 6 | 6 | 41 |
| CO3 | 2 | - | 1 | - | 18 | 6 | 27 |
| CO4 | 2 | - | 18 | - | - | - | 20 |
| CO5 | - | - | - | - | 12 | - | 12 |
| CO6 | - | - | - | 12 | - | - | 12 |
|  | | | | | | | **124** |

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Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18FP2020** | **Duration** | **3hrs** |
| **Course Name** | **BAKERY, BEVERAGES AND CONFECTIONERY TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | The Hagberg Falling number permitted for a good quality bread is? | | CO2 | R | 1 |
| 2. | Name the device used in the inspection laboratory to divide the wheat kernel samples into smaller sized portions for factor determinations. | | CO1 | R | 1 |
| 3. | Expand – GMS. | | CO1 | R | 1 |
| 4. | Name an emulsifier used in biscuit manufacture. | | CO4 | R | 1 |
| 5. | Recall – **TCH.** | | CO5 | R | 1 |
| 6. | Expand ICUMSA. | | CO4 | R | 1 |
| 7. | If a fruit mixture contains 20% w/v of sugar, can you calculate the maximum alcohol content possible by fermentation? | | CO5 | A | 1 |
| 8. | Suggest a suitable acidulant for cola-type of beverage. | | CO3 | U | 1 |
| 9. | ***Doctoring*** in confectionery technology refers to….? | | CO4 | R | 1 |
| 10. | Type of pectin used for diabetic jellies is \_\_\_\_\_\_. | | CO5 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Enlist the significance of Hagberg Falling number. | | CO2 | A | 3 |
| 12. | What is ***checking*** in biscuits | | CO4 | U | 3 |
| 13. | What is the importance of imbibition? | | CO5 | U | 3 |
| 14. | Can you briefly explain the process of chaptalization? | | CO5 | A | 3 |
| 15. | Illustrate the classification of distilled beverages | | CO2 | U | 3 |
| 16. | Chocolates stick to the cover and become messy during the summer. Examine the reason and suggest a suitable solution | | CO4 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss in detail on the method of manufacture of refined wheat flour. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18 | a. | Ms. Cakeo & co. wants your help in the manufacture of black forest type of cakes. Can you help them? | CO3 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Discuss in detail on the methods of defecation of sugarcane juice | CO4 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate briefly the process involved in the manufacture of lager beer. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21 | a | With the help of a neat flow diagram, discuss in detail on the technology involved in the manufacture of a carbonated beverage. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Outline the steps involved in the manufacture of toffees. | CO5 | U | 9 |
|  | b. | Describe the reason for graining observed during storage of hard-boiled candies. | CO2 | A | 3 |
|  |  |  |  |  |  |
| 23. | a. | Mr. A seeks your guidance in setting up a company manufacturing *Dark fantasy* types of biscuits. Can you explain him the process for the same? | CO3 | A | 8 |
|  | b. | Outline the method of Jaggery manufacture | CO2 | U | 4 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss in detail on the steps involved in the manufacture of dark chocolates, highlighting the importance of each step. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on the ingredients1, process and machinery involved in bakery and confectionery and beverage technology. |
| CO2 | To understand the importance and effect of quality of raw materials on the final products |
| CO3 | To apply the knowledge gained in formulating new types of products |
| CO4 | To critically analyze the process for maintaining and improving the quality of the final product |
| CO5 | To evaluate the steps involved in the process and improve existing technologies or develop newer technologies |
| CO6 | To design and create newer process and products that are better economically, nutritionally or technologically |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 |  | 12 |  |  |  | 14 |
| CO2 | 1 | 3+4 | 3+3 |  |  |  | 14 |
| CO3 |  | 1 | 8 | 12 |  |  | 21 |
| CO4 | 3 | 3+12 | 12 | 3 |  |  | 33 |
| CO5 | 1 | 3+12 | 2+3+9 |  |  |  | 30 |
| CO6 |  |  | 12 |  |  |  | 12 |
|  | | | | | | | **124** |



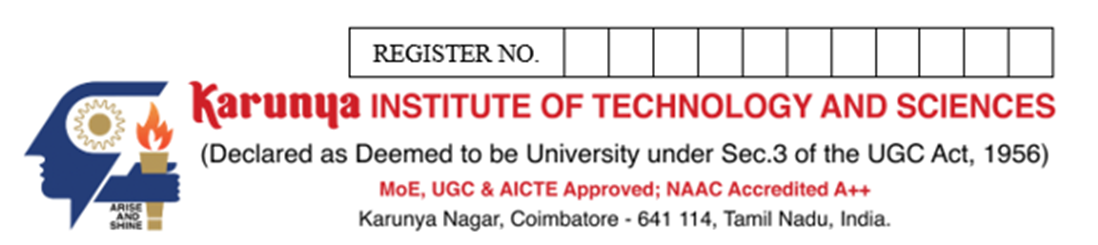
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| --- | --- | --- | --- |
| **Course Code** | **18FP2020** | **Duration** | **3hrs** |
| **Course Name** | **BAKERY, BEVERAGES AND CONFECTIONERY TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | The Hagberg Falling number permitted for a good quality bread is\_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 2. | Expand – **ADD** in bread manufacture. | | CO1 | R | 1 |
| 3. | Justify the addition of Calcium propionate to bread. | | CO1 | A | 1 |
| 4. | Name an emulsifier used in biscuit manufacture. | | CO4 | R | 1 |
| 5. | Recall – **TCH.** | | CO5 | R | 1 |
| 6. | An alternate name for ***Barbados sugar*** is \_\_\_\_\_\_\_\_\_\_. | | CO4 | R | 1 |
| 7. | Recall the yeast used in manufacture of *ale* beers. | | CO5 | R | 1 |
| 8. | Can you suggest a suitable acidulant for grape-type of beverage? | | CO3 | U | 1 |
| 9. | ***Doctoring*** in confectionery technology refers to\_\_\_\_\_\_\_\_\_\_\_. | | CO4 | R | 1 |
| 10. | Calculate the amount of sugar needed to produce wine of 20% w/v of alcohol. | | CO5 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Mr X. needs your expertise to understand the application of a deck type oven. Can you guide him? | | CO1 | A | 3 |
| 12. | Explain the term – ***Oven spring***. | | CO4 | U | 3 |
| 13. | Can you outline any one method of quality characterization of raw sugarcane? | | CO5 | U | 3 |
| 14. | Outline the process for manufacture of port wine. | | CO5 | A | 3 |
| 15. | It is commonly observed that a pack of ***Halls,*** gets sticky, making it difficult to remove the same from the wrapper. Can you tell the reason and give a suitable solution for this phenomenon? | | CO4 | An | 3 |
| 16. | Chocolates stick to the cover and become messy during the summer. Examine the reason and suggest a suitable solution. | | CO4 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | A start-up company, is seeking your expertise for the manufacture of *rawa* from wheat. Can you help them? | CO1 | A | 9 |
|  | b. | Outline the method for gluten estimation. | CO2 | U | 3 |
|  |  |  |  |  |  |
| 18. | a. | Mr. X. wants your consultation on the manufacture of multi grain bread on a small scale. He wants it also to be as soft as the commercially available bread. Can you suggest him the best method of dough preparation? | CO3 | An | 3 |
|  | b. | Give reasons and your suggestions to avoid the following –   1. Coarse and open crumb structure in breads 2. Cakes not rising to the maximum volume 3. Checking in biscuits | CO4  CO4  CO4 | A  A  A | 3  3  3 |
|  |  |  |  |  |  |
| 19. | a. | Outline the process of imbibition and its types in sugar manufacture. . Summarise the reasons for the same. | CO5 | A | 8 |
|  | b. | Can you also suggest a suitable evaporator for a crystal sugar manufacture and give its working principle? | CO1 | A | 4 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate briefly the process involved in the manufacture of ale beer. | CO5 | U | 7 |
|  | b. | Mr X. wants to develop a sugar-free cola-type carbonated beverage with naturally occurring protein-based sweeteners. Can you help him? | CO3 | An | 5 |
|  |  |  |  |  |  |
| 21. | a. | Outline the steps involved in the manufacture of candies. | CO5 | U | 3 |
|  | b. | Briefly discuss the batch type cookers involved in the manufacture of same. | CO1 | U | 6 |
|  | c. | Give any three reasons for a dull finish observed during the manufacture of hard boiled candies. | CO2 | A | 3 |
|  |  |  |  |  |  |
| 22. | a. | Mr. A seeks your guidance in setting up a company manufacturing *Dark fantasy* types of biscuits. Can you explain him the process for the same? | CO4 | A | 8 |
|  | b. | Mr. YY wants certain clarifications on the concept of ***Departure time*** in a farinogram. Can you explain the same as also its significance? | CO6 | A | 4 |
|  |  |  |  |  |  |
| 23. | a. | Outline the method of Jaggery manufacture | CO5 | U | 6 |
|  | b. | Illustrate the steps involved in the manufacture of distilled spirits | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Outline the process of conching and its importance in the manufacture of chocolates. | CO3 | A | 5 |
|  | b. | Illustrate the steps involved in the manufacture of cocoa powder. | CO3 | U | 7 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on the ingredients1, process and machinery involved in bakery and confectionery and beverage technology. |
| CO2 | To understand the importance and effect of quality of raw materials on the final products |
| CO3 | To apply the knowledge gained in formulating new types of products |
| CO4 | To critically analyze the process for maintaining and improving the quality of the final product |
| CO5 | To evaluate the steps involved in the process and improve existing technologies or develop newer technologies |
| CO6 | To design and create newer process and products that are better economically, nutritionally or technologically |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 6 | 17 |  |  |  | 24 |
| CO2 | 1 | 3 | 3 |  |  |  | 7 |
| CO3 |  | 8 | 5 | 8 |  |  | 21 |
| CO4 | 3 | 9 | 20 | 3 |  |  | 35 |
| CO5 | 2 | 19 | 12 |  |  |  | 33 |
| CO6 |  |  | 4 |  |  |  | 4 |
|  | | | | | | | **124** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18FP2021** | **Duration** | **3hrs** |
| **Course Name** | **FOOD SAFETY REGULATIONS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | ……………..is the ex officio Chairperson of the Central Advisory Committee. | | CO1 | R | 1 |
| 2. | Point out the legislation enacted by GoI as a central legislation in the year 1954 to prevent adulteration of food. | | CO1 | U | 1 |
| 3. | The Codex Alimentarius establishes ……………… levels for various harmful pesticides. | | CO3 | R | 1 |
| 4. | In the codex alimentatius setup ……………….prepares draft standards. | | CO1 | U | 1 |
| 5. | Identify part I and III of the protocol of provisional application of GATT. | | CO3 | R | 1 |
| 6. | In case a person holding stock of grain is asked to sell to Central Government as per ECA (1955), at what price does he sell it? | | CO3 | U | 1 |
| 7. | ………………. is a measure of how far a given process deviates from perfection. | | CO4 | U | 1 |
| 8. | The Food and Drug Administration (FDA) considers GM foods ……………. equivalent to their non-GM versions. | | CO4 | R | 1 |
| 9. | In HACCP systems ………………..audit evaluates the status of the prerequisite programmes followed in the plant. | | CO6 | U | 1 |
| 10. | IS………….. is the BIS standard for packaged natural mineral water. | | CO2 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Distinguish between the functions of Scientific Panel and Scientific Committees of the Food Safety Standards Authority of India. | | CO1 | R | 3 |
| 12. | Draw Organizational Structure of FSSAI. | | CO5 | U | 3 |
| 13. | List the issues that are not covered under the labelling regulation 1139/98 for GMO foods. | | CO2 | R | 3 |
| 14. | State the 3 types of nutritional and health claims that are permitted in France with suitable controls. | | CO2 | R | 3 |
| 15. | Point out the necessary members of a HACCP multi-disciplinary core team. | | CO6 | U | 3 |
| 16. | Breakdown the requirements of 21 CFR & 165.110 (Code of Federal Regulations) w.r.t – bottled drinking water. | | CO4 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Write the format followed while designing commodity standards as set out in the Procedural Manual of the Codex Alimentarius Commission. | CO1 | U | 8 |
|  | b. | Recall the mandate of World Trade Organization. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the functions of a food analyst. | CO4 | U | 6 |
|  | b. | Explain the roles and responsibilities of Food safety Officer. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 19. | a. | Discuss why it is important to interpret the FSSAI, 2006 in the spirit of the Act with reference to the clause action case between Authorized Officer of FSSAI versus M/s. Mondolez India Food Ltd regarding import of cocoa beans. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate how the 7 principles of HACCP can be implemented in a Fruit beverage industry. (Diagrams and Flowcharts can be used to emphasize your argument). | CO6 | R | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the general considerations and principles followed for quality of Drinking Water as per WHO w.r.t Microbial, disinfection, chemical, radiological and acceptability aspects. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Recall the procedure to be followed by FBOs (food business operators) to obtain FSSAI license and registration | CO2 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Summarize the 3 approaches used for planning HACCP Projects, with relevant examples for each process. | CO6 | U | 6 |
|  | b. | Illustrate the application of ISO 22000 Food Safety Management system to a Milk Processing line. | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Summarize the Provisions under AGMARK Act. | CO5 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the regulations followed in various food industries. |
| CO2 | Define the food labeling patterns. |
| CO3 | Apply the knowledge in food industries. |
| CO4 | Analyze the safety operations involved in food systems. |
| CO5 | Evaluate the steps involved in the process operations in food industries. |
| CO6 | Prepare HACCP standards for food industries. |

|  |  |  |  |  |  |  |  |
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 10 | - | - | - | - | 18 |
| CO2 | 7 | 12 | - | - | - | - | 19 |
| CO3 | 2 | 13 | - | - | - | - | 15 |
| CO4 | 4 | 19 | - | - | - | - | 23 |
| CO5 | 6 | 21 | - | - | - | - | 27 |
| CO6 | 12 | 10 | - | - | - | - | 22 |
|  | | | | | | | **124** |



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| **Course Code** | **18FP2027** | **Duration** | **3hrs** |
| **Course Name** | **FOOD PROCESS EQUIPMENT DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Application of Cr in steel. | | CO1 | A | 1 |
| 2. | Deduce an equation for tensile stress. | | CO1 | R | 1 |
| 3. | Suggest support type for large horizontal pressure vessel. | | CO2 | R | 1 |
| 4. | Identify the head type, which is suitable for high pressure. | | CO2 | R | 1 |
| 5. | Suggest the type of arrangement needed, if the reaction vessel cover is to be opened frequently. | | CO3 | U | 1 |
| 6. | Explain the situation, if the vessel is considered as an autoclave. | | CO3 | R | 1 |
| 7. | Application of heat exchangers. | | CO4 | U | 1 |
| 8. | The equipment consists of a number of parallel tubes enclosed in a relatively close-fitting cylindrical shell is known as \_\_\_\_\_\_\_\_\_\_\_\_. | | CO4 | R | 1 |
| 9. | Evaporators are used for \_\_\_\_\_\_\_\_\_ liquids. | | CO5 | U | 1 |
| 10. | Suggest the turbine agitator for maximum power economy. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Design and selection considerations for food processing equipment. | | CO1 | An | 3 |
| 12. | A thin cylinder is subjected to internal pressure of 10 MPa, internal cylinder diameter is 1000 mm and wall thickness is 10 mm. Determine circumferential stress, axial stress and radial stress. | | CO2 | E | 3 |
| 13. | Distinguish between flat heads and formed heads. | | CO3 | An | 3 |
| 14. | Draw neat diagram of different coil and channel welded to shell for reaction vessel. | | CO4 | U | 3 |
| 15. | Discuss about plate type heat exchanger. | | CO5 | An | 3 |
| 16. | Discuss the baffles size and disposition for efficient mixing. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Analyze stress – strain curve for ductile material. | CO1 | An | 4 |
|  | b. | Analyze the stress developed in thin pressure vessel. | CO1 | An | 8 |
| 18. | a. | Summarize the corrosion of food processing equipment. | CO2 | An | 4 |
|  | b. | Discuss the materials used for construction of food processing equipment. | CO2 | U | 8 |
| 19. | a. | Explain types of joints used for design of storage vessels. | CO3 | U | 2 |
|  | b. | A thick cylinder has 250 mm inner diameter and 350 mm outer diameter. The internal pressure is 30MPa and external pressure is 10MPa. Find the longitudinal stress, maximum and minimum hoop stress. And also verify σc – σr = constant. | CO3 | E | 10 |
| 20. | a. | Explain design of rectangular tank for storage of liquids. | CO4 | An | 6 |
|  | b. | Explain hortospheres or spherical vessels for storage of gases. | CO4 | A | 6 |
| 21. | a. | Explain jackets and coils used in heating system for reaction vessels with neat diagram. | CO5 | U | 6 |
|  | b. | Explain agitation system for reaction vessels. | CO5 | A | 6 |
| 22. | a. | Design a reaction vessel shell with half coil. | CO5 | E | 8 |
|  | b. | Explain about heating system used in reaction vessel. | CO5 | U | 4 |
| 23. | a. | Briefly explain long tube vertical evaporator with neat sketch. | CO6 | A | 4 |
|  | b. | Briefly explain horizontal tube evaporator with neat sketch. | CO6 | A | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain in detail about tray dryer with neat sketch. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the factors that will affect the design of equipments. |
| CO2 | Classify the variables based on various properties. |
| CO3 | Interpret the relation between various process variables. |
| CO4 | Select the critical variables for the design of equipments. |
| CO5 | Develop a conceptual design model. |
| CO6 | Assess the validity of the conceptual model. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | - | 1 | 15 | - | - | 17 |
| CO2 | 2 | 8 | - | 7 | - | - | 17 |
| CO3 | 1 | 3 | - | 3 | 10 | - | 17 |
| CO4 | 1 | 4 | 6 | 6 | - | - | 17 |
| CO5 | - | 11 | 6 | 3 | 8 | - | 28 |
| CO6 | - | 4 | 12 | 12 | - | - | 28 |
|  | | | | | | | **124** |



**SUPPLEMENTARY EXAMINATION JUNE 2023**

|  |  |  |  |
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| **Course Code** | **18FP2030** | **Duration** | **3hrs** |
| **Course Name** | **FOOD ADDITIVES** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Cite an example of a natural antioxidant. | | CO1 | U | 1 |
| 2. | Expand NOAEL. | | CO1 | R | 1 |
| 3. | List out the oral LD50 of Nisin. | | CO3 | R | 1 |
| 4. | Predict an acidulant that is effective against black bread mold. | | CO2 | U | 1 |
| 5. | Locate an enzyme that mainly acts upon the starch during milling. | | CO4 | R | 1 |
| 6 | Give an example of a crumb whitener. | | CO4 | U | 1 |
| 7. | Cite an example of a carotenoid pigment. | | CO2 | U | 1 |
| 8. | Name the flavor that is obtained from lemongrass. | | CO2 | R | 1 |
| 9. | Quote the sweetening agent that is considered an “Arch Criminal” | | CO5 | R | 1 |
| 10. | Recall the fat replacer whose functional property is similar to Cocoa butter. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Define GRAS. Mention the regulations explained in 21 CFR 184.1 Sec. | | CO1 | R | 3 |
| 12. | Write any three factors affecting lipid oxidation. | | CO2 | U | 3 |
| 13. | Record any three functions of flour improvers. | | CO2 | A | 3 |
| 14. | Define synthetic colorants with suitable examples. | | CO4 | R | 3 |
| 15. | Report any three ideal requirement of sweeteners. | | CO5 | U | 3 |
| 16. | Express the role of nutritional additives. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Categorize food additives based on functions with suitable example. | CO1 | R | 8 |
|  | b. | Write the role of JECFA. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Iillustrate the mechanism of action of any four acidulates on foods. | CO4 | U | 6 |
|  | b. | List the applications of any three bio preservatives. | CO2 | R | 6 |
|  |  |  |  |  |  |
| 19. | a. | Define flour improvers. Discuss the properties and applications of flour improvers used in bakery products. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Articulate the chemical properties and role of natural colorants added in foods (Any three) | CO4 | A | 9 |
|  | b. | Categorize flavorants based on the origin and nature of raw materials. | CO3 | An | 3 |
|  |  |  |  |  |  |
| 21. | a. | List out any four nutritive sweeteners. Explain the source and role of sweeteners in food products. | CO4 | A | 8 |
|  | b. | Determine the role of fat based fat-replacers. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 22. | a. | Distinguish between natural and synthetic antioxidants. Outline the applications of any three synthetic antioxidants. | CO4 | U | 6 |
|  | b. | Describe the mechanism of destabilization of emulsions. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 23. | a. | Predict the goals of food additive intake assessment. | CO5 | U | 4 |
|  | b. | Define the following terms: 1. Reference Dose 2. Maximal permissible intake per day. 3. Maximal Permissible level in food.4. Estimated Daily Intake | CO3 | U | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the chemical properties and applications of nutritional additives. (Any three) | CO4 | An | 6 |
|  | b. | Define sequesterants. Report the role of chelating agents in food systems. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Know about importance of additives in maintaining or improving food quality. |
| CO2 | Learn about the development of various instant premixes by addition of preservatives within the permissible limits. |
| CO3 | Understand the applications of food additives and how to study the toxicity of food additives. |
| CO4 | Study the importance of additives in maintaining or improving food quality. |
| CO5 | Identify and design newer products, with better quality using additives which are economical and safe. |
| CO6 | Describe the properties, levels of addition and toxicity data of various food additives. |

|  |  |  |  |  |  |  |  |
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 12 | 5 |  |  |  |  | 17 |
| CO2 | 7 | 17 | 7 |  |  |  | 31 |
| CO3 | 1 | 8 |  | 3 |  |  | 12 |
| CO4 | 10 | 13 | 17 | 6 |  |  | 46 |
| CO5 | 2 | 7 |  |  |  |  | 9 |
| CO6 |  | 3 | 6 |  |  |  | 9 |
|  | | | | | | | **124** |



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| **Course Code** | **18FP2030** | **Duration** | **3hrs** |
| **Course Name** | **FOOD ADDITIVES** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Cite an example of a natural colorant. | | CO1 | U | 1 |
| 2. | Expand PFA. | | CO1 | R | 1 |
| 3. | Name an organic acid that is added to the wine. | | CO2 | R | 1 |
| 4. | Predict an example of a synthetic antioxidant. | | CO2 | U | 1 |
| 5. | Quote an example of mineral salt rich in nitrogen used as a flour improver. | | CO3 | R | 1 |
| 6 | Name the pigment found in turmeric. | | CO3 | R | 1 |
| 7. | Give an example of a flavor enhancer. | | CO4 | U | 1 |
| 8. | Name a protein based fat substitute found in whey protein concentrate. | | CO4 | R | 1 |
| 9. | Give an example of a nutritive sweetener. | | CO5 | U | 1 |
| 10. | Identify the water activity of honey used as a natural sweetener. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Define NOAEL. | | CO1 | R | 3 |
| 12. | Write any three functions of preservatives. | | CO2 | U | 3 |
| 13. | Interpret the role of Lecithin as an emulsifier. | | CO3 | U | 3 |
| 14. | Write any three applications of gum. | | CO4 | U | 3 |
| 15. | State any three important functions of flavourant. | | CO5 | R | 3 |
| 16. | Define nutritional additives with a suitable example. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Classify food additives with a special mention of the functions of each category. | CO1 | U | 8 |
|  | b. | Write the role of JECFA. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Define acidulants. Mention the physico chemical properties of acidulants. | CO2 | R | 4 |
|  | b. | Identify the applications of any four organic acids. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 19. |  | Discuss the role of dough conditioners in foods with a special mention of applications in bakery products. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain the source, role ,and mechanism of action of natural colorants in foods (Any four) | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Distinguish between fat replacers and fat substitutes. Give a note on starch based and protein based fat replacers with suitable examples. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Compare natural and Synthetic antioxidants. Explain the applications of any three synthetic antioxidants. | CO4 | A | 6 |
|  | b. | Illustrate the mechanism of destabilization of emulsions. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Summarize the methods of estimating dietary intake of food additives. | CO3 | U | 8 |
|  | b. | Record the applications of Nisin and Natamycin. | CO3 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Differentiate enzymatic and non-enzymatic browning. Write a detailed note on browning inhibitors. | CO6 | U | 6 |
|  | b. | Define sequestrants. Mention the applications of chelating agents added to food products. | CO6 | R | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Know about importance of additives in maintaining or improving food quality. |
| CO2 | Learn about the development of various instant premixes by addition of preservatives within the permissible limits. |
| CO3 | Understand the applications of food additives and how to study the toxicity of food additives. |
| CO4 | Study the importance of additives in maintaining or improving food quality. |
| CO5 | Identify and design newer products, with better quality using additives which are economical and safe. |
| CO6 | Describe the properties, levels of addition and toxicity data of various food additives. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 13 | - | - | - | - | 17 |
| CO2 | 13 | 4 | - | - | - | - | 17 |
| CO3 | 2 | 23 | 4 | - | - | - | 29 |
| CO4 | 1 | 4 | 24 | - | - | - | 29 |
| CO5 | 4 | 13 | - | - | - | - | 17 |
| CO6 | 9 | 6 | - | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| --- | --- | --- | --- |
| **Course Code** | **18FP2031** | **Duration** | **3hrs** |
| **Course Name** | **PLANTATION AND SPICES PRODUCT TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the saint who introduced the coffee beans first time in India. | | CO1 | R | 1 |
| 2. | Predict the time and temperatures used in short withering periods in the manufacture of black tea. | | CO1 | U | 1 |
| 3. | Point out the minimum fat content to be present in cocoa bean for use in chocolates. | | CO2 | R | 1 |
| 4. | Recognize the type of chocolate that if eaten alone, may be harsh enough to be objectionable to many consumers. | | CO4 | R | 1 |
| 5. | In case of surat of curing ginger, predict the number of days the gingers are sun dried before soaking. | | CO2 | E | 1 |
| 6. | Recall the dry recovery percentage of black pepper. | | CO3 | R | 1 |
| 7. | Describe a “Spotted and cracked” vanilla. | | CO4 | R | 1 |
| 8. | Predict the percentage of oil formed in a palm fruit approaching maturity w.r.t mesocarp weigh. | | CO5 | E | 1 |
| 9. | Recall the chemical agent which is commonly used to remove the moisture content from peppermint oil. | | CO5 | R | 1 |
| 10. | Recall the compound responsible for the sweet taste of cinnamon. | | CO2 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Distinguish between parchment coffee and cherry coffee. | | CO1 | E | 3 |
| 12. | Describe the quality characteristics of Black and Brown vanilla. | | CO3 | U | 3 |
| 13. | On the coast of java cocoa trees grow at an altitude of 150m above sea level. The average temperature in the Puerto Rico is 400C. Calculate the number of days taken by the cocoa trees in the above mentioned location to reach maturity. | | CO1 | Ap | 3 |
| 14. | Describe the stage in the production of cinnamon quills. | | CO2 | U | 3 |
| 15. | Point out the four isomeric forms of piperinic acid. | | CO4 | An | 3 |
| 16. | Explain the methods of curing of ginger. | | CO5 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No 17 to 23, Q. No 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the manufacturing process of instant tea. | CO1 | U | 6 |
|  | b. | Describe the manufacturing process of black tea. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Outline the method of pulping and demucilaging of coffee berry. | CO2 | An | 8 |
|  | b. | Write a note on hulling of coffee parchment. | CO2 | Ap | 4 |
|  |  |  |  |  |  |
| 19. | a. | Summaries the model ordinance described by ICS to determine the merchantability of cocoa beans. | CO6 | E | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the test protocol for Cleanliness, Ash level, AIA, Volatile Oil, Moisture content, aw, Mycotoxin level, Bulk density, Particle size as per ASTA. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Explain the processing of cinnamon and cinnamon based products of commercial importance. | CO6 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Summarize the different methods used of commercially extracting essential oil. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the manufacture of coconut based products of commercial importance. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Outline the harvest and post-harvest technologies used in processing vanilla. | CO4 | An | 12 |

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Define the different unit operations and its equipments involved in coffee, tea and cocoa processing |
| CO2 | Gain knowledge in processing of plantation crops and spices and also its value added products |
| CO3 | Outline ways in which quality loss can be minimised during preparation and processing |
| CO4 | Develop value added products from plantation products and spices |
| CO5 | Demonstrate appropriate technique for the extraction of spice oil and oleoresin with quality standards |
| CO6 | Acquire a confident to get placement in any kind of cereals and spices industry with minimum post-harvest losses and maximum benefit to the industry |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | 3 | - | 3 | - | 20 |
| CO2 | 2 | 3 | 4 | 8 | 1 | - | 18 |
| CO3 | 1 | 15 | - | - | - | - | 16 |
| CO4 | 2 | - | - | 15 | - | - | 17 |
| CO5 | 13 | - | - | 15 | 1 | - | 29 |
| CO6 | - | - | - | 12 | 12 |  | 24 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **18FP2031** | **Duration** | **3hrs** |
| **Course Name** | **PLANTATION AND SPICES PRODUCT TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the coffee variety that was completely lost in the epidemic of trachemycosis in the early 1940s. | | CO3 | R | 1 |
| 2. | Predict the time and temperatures used in short and long withering periods in the manufacture of black tea. | | CO1 | U | 1 |
| 3. | Point out the temperature at which chocolates remain solid and the temperature at which they melt. | | CO2 | R | 1 |
| 4. | Recognize the primary categories of chocolate. | | CO4 | R | 1 |
| 5. | In case of malabar method of curing ginger, predict the soaking time and percentage of Ca(OH)2used. | | CO2 | E | 1 |
| 6. | Recall the dry recovery percentage of black pepper. | | CO3 | R | 1 |
| 7. | Describe a “Zacatillo” vanilla. | | CO4 | R | 1 |
| 8. | Predict the level of FFA content of the oil in a fresh ripe, un-bruised palm fruit. | | CO5 | E | 1 |
| 9. | The essential oil and eugenol acetate content of whole clove increases slightly after storing for six months. **(True/False)** | | CO5 | R | 1 |
| 10. | Recall the compound responsible for the sweet taste of cinnamon. | | CO2 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List the chemical and bio-chemical changes during withering of tea leaves. | | CO2 | R | 3 |
| 12. | Describe the quality characteristics of Black and Brown vanilla. | | CO3 | U | 3 |
| 13. | On the coast of java cocoa trees grow at an altitude of 110m above sea level. The average temperature in the cost of java is 200C. Calculate the number of days taken by the cocoa trees in the above mentioned location to reach maturity. | | CO1 | A | 3 |
| 14. | Point out the reason for digesting the palm fruit at high temperature. | | CO3 | An | 3 |
| 15. | Point out the four isomeric forms of piperinic acid. | | CO4 | An | 3 |
| 16. | Summarize the quality specifications of Sri Lankan cinnamon w.r.t moisture, total ash and acid insoluble ash. | | CO3 | E | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No 17 to 23, Q. No 24 is Compulsory)** | | | | | |
| 17. | a. | Contrast the infusion color, plucking criteria and manufacturing process of Green tea, Yellow tea, Red tea and Dark tea. | CO2 | E | 4 |
|  | b. | Discuss in detail the manufacture of Instant tea. | CO2 | U | 8 |
| 18. | a. | Outline the method of pulping and demucilaging in the manufacture of parchment coffee. | CO2 | An | 8 |
|  | b. | Write a note on the industrial methods of extraction of Roasted & Ground coffee brew. | CO2 | A | 4 |
| 19. |  | Summaries the model ordinance described by ICS to determine the merchantability of cocoa beans. | CO6 | E | 12 |
| 20. |  | Explain the different tests or methods used to measure the quality of spices and spice based products as per ASTA. | CO3 | U | 12 |
| 21. |  | Explain the processing of clove and clove based products based on their commercial importance. | CO6 | An | 12 |
| 22. |  | Summarize the different methods used of commercially extracting essential oil. | CO5 | An | 12 |
| 23. |  | Explain the manufacture of desiccated coconut, coconut milk and virgin coconut oil. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the unit operations involved in the harvesting and processing of vanilla. | CO4 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Define the different unit operations and its equipments involved in coffee, tea and cocoa processing. |
| CO2 | Gain knowledge in processing of plantation crops and spices and also its value added products. |
| CO3 | Outline ways in which quality loss can be minimised during preparation and processing. |
| CO4 | Develop value added products from plantation products and spices. |
| CO5 | Demonstrate appropriate technique for the extraction of spice oil and oleoresin with quality standards. |
| CO6 | Acquire a confident to get placement in any kind of cereals and spices industry with minimum post-harvest losses and maximum benefit to the industry. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 1 | 3 | - | - | - | 4 |
| CO2 | 5 | 8 | 4 | 8 | 5 | - | 30 |
| CO3 | 2 | 15 | - | 3 | 3 | - | 23 |
| CO4 | 2 | - | - | 15 | - | - | 17 |
| CO5 | 1 | 12 | - | 12 | 1 | - | 26 |
| CO6 | - | - | - | 12 | 12 | - | 24 |
|  | | | | | | | **124** |



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| **Course Code** | **18FP2033** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF MEAT, POULTRY AND FISH** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Indicate the myoglobin content of lamb meat. | | CO1 | U | 1 |
| 2. | Recall the connective tissue that wraps each individual muscle fibre. | | CO1 | R | 1 |
| 3. | Define stunning process. | | CO2 | R | 1 |
| 4. | Define massaging process in meat tenderization. | | CO2 | R | 1 |
| 5. | Cite the water activity for intermediate moisture meat. | | CO3 | U | 1 |
| 6. | Cite one example for alkaline based detergent. | | CO3 | U | 1 |
| 7. | Recall the percentage weight of yolk in total egg. | | CO4 | R | 1 |
| 8. | What is the final temperature of poultry carcass before shipment? | | CO4 | R | 1 |
| 9. | Quote the protein content from fish. | | CO5 | R | 1 |
| 10. | Expand IQF. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | State the different chemical states for myoglobin along with the color associated with them. | | CO1 | R | 3 |
| 12. | Categorize muscle proteins based on the structure and function. | | CO1 | Ap | 3 |
| 13. | Comment on preservative action of sodium chloride. | | CO3 | U | 3 |
| 14. | Enlist any 4 factors affecting quality of meat. | | CO2 | R | 3 |
| 15. | Draw and label the structure of egg. | | CO5 | C | 3 |
| 16. | Recall different chilling methods of fish. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the fat composition and its modifiers | CO1 | R | 6 |
|  | b. | Write short notes on spoilage in meat and meat products. | CO1 | R | 6 |
| 18. | a. | Describe the Stunning methods. | CO2 | R | 6 |
|  | b. | Explain modern abattoir and some their features . | CO2 | An | 6 |
| 19. | a. | Describe the process of canning of meat | CO3 | U | 6 |
|  | b. | Write short notes on cured and dried meat | CO3 | C | 6 |
| 20. | a. | Illustrate HACCP plan in meat industry. | CO4 | U | 6 |
|  | b. | Describe meat hygiene guidelines | CO4 | U | 6 |
| 21. | a. | Summarize the spoilage in eggs. | CO5 | U | 6 |
|  | b. | Describe the packaging techniques in poultry. | CO5 | U | 6 |
| 22. | a. | Describe the spoilage factors for fish. | CO6 | U | 6 |
|  | b. | Write notes on ice used in icing of fish. | CO6 | C | 6 |
| 23. | a. | Summarize post mortem changes in muscles after the slaughtering. | CO1 | U | 6 |
|  | b. | Highlight on frozen and cooked refrigerated meat. | CO3 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe Factors influencing quality of chilling of fish and changes in fish during chilling. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Enumerate the composition and role of microorganisms in meat. |
| CO2 | Understand the slaughtering, carcass processing methods and equipments used for processing meat. |
| CO3 | Apply the technological ideas in preparation of various types of meat products and design of equipments. used for processing meat. |
| CO4 | Understand the HACCP and GMP of meat processing. |
| CO5 | Evaluate the processing of poultry meat, meat products and egg products. |
| CO6 | Predict the role of microorganisms in spoilage, biochemistry, preservation and fishery products. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 7 | 3 |  |  |  | 26 |
| CO2 | 11 |  |  | 6 |  |  | 17 |
| CO3 |  | 11 |  |  |  | 6 | 17 |
| CO4 | 2 | 12 |  |  |  |  | 14 |
| CO5 | 1 | 12 |  |  |  | 3 | 16 |
| CO6 | 1 | 21 |  |  |  | 6 | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18FP2037** | **Duration** | **3hrs** |
| **Course Name** | **PROCESS ECONOMICS AND PLANT LAYOUT DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | “C” in PIECES stands for\_\_\_\_\_\_\_ | | | CO1 | U | 1 |
| 2. | Undercapitalization refers to. | | | CO1 | R | 1 |
| 3. | List the types of plant layout. | | | CO2 | R | 1 |
| 4. | Define plant layout. | | | CO2 | R | 1 |
| 5. | Expand HACCP. | | | CO3 | R | 1 |
| 6. | OSHA refers to | | | CO4 | R | 1 |
| 7. | Cost index refers to. | | | CO5 | R | 1 |
| 8. | Capital cost is the sum of. | | | CO5 | R | 1 |
| 9. | Break even point refers to. | | | CO6 | U | 1 |
| 10. | ROI stands for. | | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Mr. X wants to know the financial analysis for tomato sauce preparation. Can you help him? | | | CO1 | An | 3 |
| 12. | Write the importance of plant layout. | | | CO2 | U | 3 |
| 13. | Mr. YY wishes to set up a meat processing industry in Coimbatore. Can you advise him on the suitability of such a project with due justification. | | | CO4 | An | 3 |
| 14. | Differentiate between process and product layout design. | | | CO2 | U | 3 |
| 15. | Mr. X wants to buy an evaporator of 1000kg/h capacity. He observed that Mr. Y has an evaporator of 50 kg/h capacity that costs Rs. 8 Lakhs. (bought in 2015). What will the projected cost of the evaporator that Mr. X wants to buy? Given – CEPCI index for 2021 and 2015 are 708 and 550.8 respectively. | | | CO5 | An | 3 |
| 16. | Mr. Fruitwala, a financial analyst, observed that the venture of XX has yielded 45 crores of total returns in 9 years. His initial investment was 2.5 crore. Can you calculate the Rate of return on investment of his venture? | | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | Explain the importance of energy and material balance in food processing industry. | CO1 | U | 3 |
|  | | b. | Tasty tasty company plans to set up an industry manufacturing 100 kg/h of mango squash. Can you help him on deciding the amount of raw materials required as also the process flow diagram for the same? | CO1 | An | 9 |
|  | |  |  |  |  |  |
| 18. | | a. | AA wants to know about the types of plant layout. Can you help her? | CO2 | A | 8 |
|  | | b. | BB wants your input on the site selection for wine processing industry. Can you advise him? | CO2 | A | 4 |
|  | |  |  |  |  |  |
| 19. | | a. | Paisawala and Co. wants your input on the process of deciding the PRPs for an orange squash manufacturing unit. Can you help them? | CO3 | A | 9 |
|  | | b. | Highlight the advantages of a process type layout design. | CO3 | U | 3 |
|  | |  |  |  |  |  |
| 20. | | a. | *Iniya* sweets wants your suggestions on deciding the technical feasibility of starting a milk processing industry. Can you help them on this? | CO4 | A | 12 |
|  | |  |  |  |  |  |
| 21. | | a. | Mr.A wants to set up an industry manufacturing 100kg/h of kalakhand. He has a plot measuring 1000 sq.m. Can you help him in designing the layout, based on your understanding of Richard Muther’s SSPL? | CO2 | A | 12 |
|  | |  |  |  |  |  |
| 22. | | a. | Mr. AA wants to set up a aseptic unit of 1000 kg/h capacity. His friend has a similar plant of 250kg/h capacity set up in 2017. Determine the total investment cost. Given – cost of the aseptic filling system in 2015 of 100 kg / h capacity was 10 Lakhs. Cost of homogenizer of similar capacity – 8 lakhs. Given – CEPCI index for 2021 and 2017 are 708 and 567.5 respectively. | CO6 | A | 12 |
|  | |  |  |  |  |  |
| 23. | | a. | Mr. YY wants to know the contribution of the following in deciding the product cost. Can you help him?  i) Labor cost ii) Utilities cost iii) Plant maintenance and repair | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Mr. Rupaiyaa wants a clear picture on the cash flow diagram. Can you help him? | CO6 | U | 4 |
|  | | b. | Based on the same – can you explain the following –  i) Discounted cash flow ii) Methods of determining DCF | CO6 | A | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on the various factors involved in setting up a Food Processing Industry. |
| CO2 | To understand the process of food plant layout design. |
| CO3 | To apply their knowledge to design projects for setting up a Food Processing Industry. |
| CO4 | To analyse the problems involved in deciding the level of manufacture of a food product. |
| CO5 | To evaluate the options involved and decide on the right choice based on the economics of the system. |
| CO6 | To develop own industry or plan turn-key projects based on the request from customers. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 | 12 | 12 |  |  | 29 |
| CO2 | 2 | 6 | 12 |  |  |  | 20 |
| CO3 | 1 | 3 | 9 | - |  |  | 13 |
| CO4 | 1 |  | 12 | 3 |  |  | 16 |
| CO5 | 2 |  | 12 | 3 |  |  | 17 |
| CO6 | - | 6 | 20 | 3 |  |  | 29 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **18FP2037** | **Duration** | **3hrs** |
| **Course Name** | **PROCESS ECONOMICS AND PLANT LAYOUT DESIGN** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | “P” in PIECES stands for \_\_\_\_\_\_\_\_\_\_. | | | CO1 | U | 1 |
| 2. | Schedule feasibility refers to \_\_\_\_\_\_\_\_\_\_. | | | CO1 | R | 1 |
| 3. | EHEDG stands for \_\_\_\_\_\_\_\_\_\_. | | | CO2 | R | 1 |
| 4. | 18:8 stainless steel refers to \_\_\_\_\_\_\_\_\_\_. | | | CO3 | R | 1 |
| 5. | Expand PRP. | | | CO2 | R | 1 |
| 6. | OSHA refers to \_\_\_\_\_\_\_\_\_\_. | | | CO5 | R | 1 |
| 7. | Salvage value for \_\_\_\_\_\_\_\_\_\_. | | | CO6 | R | 1 |
| 8. | Capital cost is the sum of \_\_\_\_\_\_\_\_\_\_. | | | CO5 | R | 1 |
| 9. | CDFRR refers to \_\_\_\_\_\_\_\_\_\_. | | | CO5 | R | 1 |
| 10. | Termination value refers to \_\_\_\_\_\_\_\_\_\_. | | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Mr. X wants to know the amount (in kg) of tomato required for preparing 200 kg of sauce. Can you help him? | | | CO1 | An | 3 |
| 12. | Write the objectives of plant layout. | | | CO6 | U | 3 |
| 13. | Mr.YY wishes to set up a fish processing industry in Coimbatore? Can you advise him on the suitability of such a project with due justification? | | | CO3 | An | 3 |
| 14. | Differentiate between process and product layout design. | | | CO2 | U | 3 |
| 15. | Mr. X wants to buy an evaporator of 1000kg/h capacity. He observed that Mr. Y has an evaporator of 50 kg/h capacity that costs Rs. 8 Lakhs. (bought in 2009). What will the projected cost of the evaporator that Mr. X wants to buy? Given – CEPCI index for 2021 and 2010 are 708 and 550.8 respectively. | | | CO5 | An | 3 |
| 16. | Mr. Paisawala, a financial analyst, observed that the venture of XX has yielded 30 crores of total returns in 7 years. His initial investment was 1 crore. Can you calculate the Rate of return on investment of his venture? | | | CO5 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | Outline the aspects that contribute to deciding the financial feasibility of a project. | CO1 | U | 3 |
|  | | b. | Mr. Doodhwala plans to set up an industry manufacturing 100 kg/h of orange marmalade. Can you help him on deciding the amount of raw materials required as also the process flow diagram for the same? | CO1 | An | 9 |
|  | |  |  |  |  |  |
| 18. | | a. | AA wants to know about the principles of sanitary design. Can you help her? | CO2 | A | 8 |
|  | | b. | BB wants your input on the hygienic design of kettles used for jam manufacture. Can you advise him? | CO2 | A | 4 |
|  | |  |  |  |  |  |
| 19. | | a. | Hullu and Co. wants your input on the process of deciding the CCPs for a orange squash manufacturing unit. Can you help them? | CO3 | A | 9 |
|  | | b. | Highlight the advantages of a product type layout design | CO3 | U | 3 |
|  | |  |  |  |  |  |
| 20. | |  | *Iniya* sweets wants your suggestions on deciding the technical feasibility of starting a Zero calorie beverages venture. Can you help them on this? | CO4 | A | 12 |
|  | |  |  |  |  |  |
| 21. | |  | Mr.A wants to set up an industry manufacturing 150kg/h of mango concentrate. He has a plot measuring 1200 sq.m. Can you help him in designing the layout, based on your understanding of Richard Muther’s SSPL? | CO2 | A | 12 |
|  | |  |  |  |  |  |
| 22. | |  | Mr. AA wants to set up a milk powder unit of 800 kg/h capacity. His friend has a similar plant of 200kg/h capacity set up in 2017. Determine the total investment cost. Given – cost of the spray dryer in 2015 of 120 kg / h capacity was 12 Lakhs. Cost of homogenizer of similar capacity – 10 lakhs. Given – CEPCI index for 2022 and 2017 are 708 and 567.5 respectively. | CO6 | A | 12 |
|  | |  |  |  |  |  |
| 23. | |  | Mr. YY wants to know the contribution of the following in deciding the product cost. Can you help him? –   1. Royalties. 2. Raw materials. 3. Maintenance and repair. | CO5 | A | 3x4 = 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Mr. Rupaiyaa wants a clear picture on the cash flow diagram. Can you help him? | CO6 | U | 4 |
|  | | b. | Based on the same – can you explain the following –   1. Explain key components of discounted cash flow. 2. Methods of determining DCF. | CO6 | A | 2x4 = 8 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on the various factors involved in setting up a Food Processing Industry. |
| CO2 | To understand the process of food plant layout design. |
| CO3 | To apply their knowledge to design projects for setting up a Food Processing Industry. |
| CO4 | To analyse the problems involved in deciding the level of manufacture of a food product. |
| CO5 | To evaluate the options involved and decide on the right choice based on the economics of the system. |
| CO6 | To develop own industry or plan turn-key projects based on the request from customers. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 |  | 12 |  |  | 17 |
| CO2 | 2 | 3 | 24 |  |  |  | 29 |
| CO3 | 1 | 3 | 9 | 3 |  |  | 16 |
| CO4 |  |  | 12 |  |  |  | 12 |
| CO5 | 3 |  | 12 | 6 |  |  | 21 |
| CO6 | 1 | 8 | 20 |  |  |  | 29 |
|  | | | | | | | **124** |



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| **Course Code** | **18FP2040** | **Duration** | **3hrs** |
| **Course Name** | **MATERIAL SCIENCE FOR FOOD ENGINEERS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the force/interaction present in HCl molecule. | | CO1 | U | 1 |
| 2. | Classify the pes of solids. | | CO1 | R | 1 |
| 3. | Define stress. | | CO2 | R | 1 |
| 4. | Define Malleability. | | CO2 | R | 1 |
| 5. | Enlist two types of fractures occurring in metals. | | CO2 | U | 1 |
| 6. | Name the force responsible for the formation of water molecule. | | CO1 | R | 1 |
| 7. | Name any two-point defects occurring in solid. | | CO3 | R | 1 |
| 8. | Write a balanced reaction occurring at cathode during corrosion of Iron. | | CO1 | U | 1 |
| 9. | Define carbon steel. | | CO4 | R | 1 |
| 10. | Define stainless steel. | | CO4 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Draw well labeled diagram indicating point defect in polymers. | | CO3 | C | 3 |
| 12. | Write a short note Elastic Modulus (E). | | CO2 | R | 3 |
| 13. | Enlist the steps in ductile fracture. | | CO2 | U | 3 |
| 14. | Explain pitting corrosion and enlist the factors affecting it. | | CO5 | U | 3 |
| 15. | Distinguish between carbon steel and stainless steel. | | CO4 | A | 3 |
| 16. | Enlist advantages of SEM and TEM. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Distinguish between amorphous and crystalline solids. | CO1 | A | 6 |
|  | b. | Enlist four important bonding types occurring in atoms and explain metallic bonding in detail. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. |  | Explain a stress strain relation for a material subjected to tensile stress by using stress strain curve. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Draw a well labelled diagram from DBTT curve. | CO2 | C | 6 |
|  | b. | Explain brittle fracture in ceramics and Enlist factors influencing brittle fracture. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Describe the Mechanism of Corrosion. | CO5 | U | 6 |
|  | b. | Describe in detail: Techniques used to prevent the corrosion. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Classify the types of stainless steel. | CO4 | U | 6 |
|  | b. | Explain in detail quenching process. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Enlist types of corrosion and explain in detail any one of them. | CO4 | U | 6 |
|  | b. | Draw a hydrogen embrittlement mechanism diagram. | CO4 | C | 6 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the factors causing fatigue life. | CO2 | U | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Write in detail explaining mechanism of XRD and its applications. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Enumerate the fundamentals of various bonds. |
| CO2 | Understand the importance of strength of material. |
| CO3 | Have a knowledge of the imperfections of metals. |
| CO4 | Have a knowledge of alloying and its importance in everyday life. |
| CO5 | Understand the various methods of characterization. |
| CO6 | Examine the application of various techniques. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 2 | 12 | - | - | 3 | 19 |
| CO2 | 5 | 22 | 12 | - | - | 6 | 45 |
| CO3 | 1 | - | - | - | - | - | 1 |
| CO4 | 2 | 18 | 3 | - | - | 6 | 29 |
| CO5 | - | 9 | - | - | - | - | 9 |
| CO6 | 3 | 12 | 6 | - | - | - | 21 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP1001** | **Duration** | **3hrs** |
| **Course Name** | **BASICS OF MICROBIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the scientist who invented the simple microscope. | | CO1 | R | 1 |
| 2. | Cite a phylogenetic method that is used to identify a bacterial species. | | CO1 | R | 1 |
| 3. | Give an example of a bacterial virus. | | CO2 | U | 1 |
| 4. | Recall the sugar derivatives found in Gram positive bacteria. | | CO2 | U | 1 |
| 5. | Quote an example for bread mold. | | CO3 | R | 1 |
| 6. | Predict the two stages of *Entamoeba histolytica.* | | CO3 | U | 1 |
| 7. | Name the compound that is responsible for the heat stability of endospores. | | CO4 | R | 1 |
| 8. | Give an example of differential media. | | CO4 | U | 1 |
| 9. | Expand MPN. | | CO5 | R | 1 |
| 10. | Predict an acidic dye that is used in negative staining. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | State the concept of biogenesis theory. | | CO1 | R | 3 |
| 12. | Classify flagella based on their location. | | CO2 | R | 3 |
| 13. | Sketch a neat structure of yeast and label its parts. | | CO3 | A | 3 |
| 14. | Define capnophiles. | | CO4 | R | 3 |
| 15. | Differentiate pour plate and spread plate technique | | CO5 | An | 3 |
| 16. | Write the mechanism of action of chlorine as antimicrobial agent. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | State any four molecular techniques that are important to identify the bacterial species. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Differentiate lytic and lysogenic cycle of bacteriophage. Describe in detail the lytic cycle of bacteriophage with a neat diagrammatic representation. | CO2 | U | 10 |
|  | b | Record the functions of bacterial endospores. | CO3 | U | 2 |
|  |  |  |  |  |  |
| 19. | a. | Discriminate hyphae and Mycelium. Illustrate the life cycle stages of Rhizopus with a special mention of the reproduction process. | CO3 | U | 8 |
|  | b. | Briefly discuss the characteristics of red algae. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 20. |  | Criticize the factors affecting the growth of bacteria in detail with appropriate examples. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | Classify pure culture techniques. Prepare a flow chart on the streak plate technique with a neat diagrammatic representation. | CO5 | A | 8 |
|  | b. | Write the principle of Negative staining. | CO5 | A | 4 |
|  |  |  |  |  |  |
| 22. | a. | With a neat sketch, explain the working principle of a transmission electron microscope. | CO5 | An | 10 |
|  | b. | Define Numerical Aperture. | CO5 | R | 2 |
|  |  |  |  |  |  |
| 23. | a. | Discuss the nutritional requirements of bacteria for their growth. | CO4 | U | 8 |
|  | b. | Write a note on selective media. | CO4 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Define Sterilization. Recommend a sterilization protocol and methods followed for media preparation. | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the developments in the discipline of Microbiology and the contributions made by prominent scientists in this field. |
| CO2 | Understand the classification of microorganisms. |
| CO3 | Identify key components and their functions in prokaryotic and eukaryotic microorganisms. |
| CO4 | Point out the bacteriological media and nutritional requirements for the growth of bacteria. |
| CO5 | Recommend the methods used for enumeration, identification, and preservation of bacteria. |
| CO6 | Create a sterilization protocol for the control of microorganisms. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 12 | - | - | - | - | 17 |
| CO2 | 3 | 12 | - | - | - | - | 15 |
| CO3 | 3 | 13 | 3 | - | - | - | 19 |
| CO4 | 4 | 9 | 4 | 12 | - | - | 29 |
| CO5 | 3 | - | 12 | 13 | - | - | 28 |
| CO6 | 3 | 1 | - | - | 12 | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2001** | **Duration** | **3hrs** |
| **Course Name** | **FOOD PROCESS CALCULATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Differentiate unit and dimension with an example. | | CO1 | U | 1 |
| 2. | Reproduce the dimension for Pressure. | | CO1 | R | 1 |
| 3. | Recall the term vapor pressure. | | CO2 | R | 1 |
| 4. | Assemble the ideal gas equation. | | CO2 | R | 1 |
| 5. | Quote an example for an unsteady state process. | | CO3 | R | 1 |
| 6. | Recognize the component used to relate the quantity of one process stream to another. | | CO3 | R | 1 |
| 7. | Differentiate between Sensible and Latent heat. | | CO4 | U | 1 |
| 8. | Define enthalpy and express in mathematical form. | | CO4 | R | 1 |
| 9. | State the concept of Heat of combustion. | | CO5 | R | 1 |
| 10. | Define Psychrometry. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | The potential energy of a body at a height of 15 m is 2kJ. If the body is moving at a velocity of 50 m/s, what is its kinetic energy?  (Take g as 9.8067 m/s2). | | CO1 | E | 3 |
| 12. | State Dalton’s and Amagat’s law and represent its equation. | | CO2 | U | 3 |
| 13. | Construct a diagram and set up a total mass balance for a dehydrator. Air enters at the rate of A lb/min, and wet material enters at W lb/min. Dry material leaves the system at D lb/min. | | CO3 | An | 3 |
| 14. | Paraphrase on standard heat of reaction & compile an equation for it. | | CO4 | U | 3 |
| 15. | Compare theoretical oxygen and excess oxygen. | | CO5 | An | 3 |
| 16. | Differentiate wet bulb and dry bulb temperature. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a | An aqueous solution of K2CO3 contains 50% salt and the specific gravity of the solution is 1.53. Determine the following:  i) The mole percent of the salt in solution  ii) The volume percent of water assuming density of water is 1000 kg/m3 and there is no volume change on mixing.  iii) The molality of the solution  iv) The molarity of the solution  v) The normality of the solution | CO1 | E | 10 |
|  | b. | Define molar volume of gaseous substances. | CO1 | U | 2 |
| 18. | a. | Summarize the kinetic theory of gases and Illustrate the gas laws. | CO2 | U | 10 |
|  | b. | A 150 L oxygen container contains gas at 300 K and 10 bar. What is the mass of oxygen in the cylinder? | CO2 | An | 2 |
| 19. | a. | A drier is fed with wet solid to reduce the moisture content from 80% to 15%. The product leaving the drier is admitted to an oven which further brings down the moisture to 2%. If the drier can handle 1000 kg of wet solid per day, calculate  a) The weight of products leaving the drier and the oven per day.  b) The percentage of the original water that is removed in the drier and the oven. | CO3 | E | 6 |
|  | b. | Construct the mass balance for a triple effect evaporator. | CO3 | A | 6 |
| 20. | a. | Examine the Hess Law of Constant Heat Summation for a chemical reaction. | CO4 | A | 6 |
|  | b. | Formulate the energy balance for an open and closed system. | CO4 | C | 6 |
| 21. | a. | Illustrate the Orsat apparatus for flue gas measurement. | CO5 | A | 6 |
|  | b. | Discuss the heat capacities of solids, liquids and gases. | CO5 | U | 6 |
| 22. | a. | The flow rate of water through a pipe is reported as 15 cubic feet per minute. Taking density of water as 1 g/cm3, Calculate the mass flow rate in kg/s. | CO1 | E | 6 |
|  | b. | A continuous distillation column is used to regenerate solvent for use in a solvent extraction unit. The column treats 200 kmol/h of a feed containing 10% (mol) ethyl alcohol and the rest water. The overhead product is 89% (mo) alcohol and the bottom product is 0.3% (mol) alcohol. The overhead is sent to the extraction unit and the bottom is washed. What is the daily requirement of make-up alcohol in the solvent extraction unit? | CO3 | An | 6 |
| 23. | a. | An evaporator has a rated evaporation capacity of 500 kg water/h. Calculate the rate of production of juice concentrate containing 45% total solids from raw juice containing 12 % solids. | CO3 | E | 6 |
|  | b. | Interpret the standard heat of reaction, combustion and formation with example. | CO4 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Elaborate on the thermodynamic properties of moist air with a help of a psychrometric chart. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the compositions of mixtures and solutions. |
| CO2 | Compare the properties of ideal and real gases. |
| CO3 | Calculate material balance for various unit operations. |
| CO4 | Analyze energy balance for unit operations. |
| CO5 | Estimate GHV, NHV and composition of fuels. |
| CO6 | Integrate the properties of air water system. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | - | - | 19 | - | 23 |
| CO2 | 2 | 13 | - | 2 | - | - | 17 |
| CO3 | 2 | - | 6 | 9 | 12 | - | 29 |
| CO4 | 1 | 4 | 12 | - | - | 6 | 23 |
| CO5 | 1 | 6 | 6 | 3 | - | - | 16 |
| CO6 | 1 | 3 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2002** | **Duration** | **3hrs** |
| **Course Name** | **FOOD CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | What is the H-O-H angle in water? | | CO1 | R | 1 |
| 2. | Example of a water-in-oil emulsion. | | CO1 | R | 1 |
| 3. | Milk sugar is also called as \_\_\_\_\_\_\_\_. | | CO1 | R | 1 |
| 4. | Expand – **DE.** | | CO2 | R | 1 |
| 5. | Ground nut oil is rich in the following fatty acid. Can you name it. | | CO3 | R | 1 |
| 6. | Expand – **BHA.** | | CO4 | R | 1 |
| 7. | Example of a an amino acid with a side chain –NH2 group. | | CO1 | R | 1 |
| 8. | Highlight the action of galactosidase. | | CO1 | A | 1 |
| 9. | Vitamin B2 is also called as \_\_\_\_\_\_\_\_\_. | | CO1 | R | 1 |
| 10. | Carotenoid found in tomato is \_\_\_\_\_\_\_\_\_. | | CO1 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Can you tell anyone method of detecting the dispersed phase and dispersion medium in an emulsion? | | CO4 | A | 3 |
| 12. | Enlist the conditions for obtaining gluconic acid from glucose | | CO1 | U | 3 |
| 13. | Summarise the role of antioxidants. | | CO6 | U | 3 |
| 14. | Give examples for Amino acid with a. side chain – OH group and b. –imino acid | | CO3 | R | 3 |
| 15. | Summarise the effects of a. light and b. heat on Vitamin C. | | CO5 | A | 3 |
| 16. | Illustrate the conditions for the formation of phaeophytin | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Briefly discuss on the following –  Structure of water and ice. | CO1 | U | 6 |
|  | b. | Zone 1 of a sorption isotherm. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Outline the principle of the Lane and Eynon’s method of reducing sugar estimation. | CO2 | U | 3 |
|  | b. | Mr. A. got the following readings while performing the reducing sugar estimation for his sample. A. Reading for standardization of glucose – 20 ml. B. Reading for reducing sugar – 16 ml. Determine the reducing sugars for 100 ml of the sample. Also outline the procedure for the same. | CO2 | A | 9 |
|  |  |  |  |  |  |
| 19. | a. | Outline the principle of Iodine value. | CO2 / | U | 3 |
|  | b. | Miss Y. has given you the following readings for the Saponification value experiment that she performed. Weight of oil taken – 4 g. Blank reading – 40 ml, Reading for the sample – 35 ml. Determine the Iodine value and mention the procedure for the same. Comment on the type of oil based on the value obtained. | CO2 | A | 9 |
|  |  |  |  |  |  |
| 20. | a. | Outline the principle of Saponification value. | CO2 | U | 3 |
|  | b. | Miss Y. has given you the following readings for the Saponification value experiment that she performed. Weight of oil taken – 4 g. Blank reading – 60 ml, Reading for the sample – 20 ml. Determine the saponification value and mention the procedure for the same. | CO2 | A | 9 |
|  |  |  |  |  |  |
| 21. | a. | Summarise on the helical structure of proteins. | CO3 | U | 6 |
|  | b. | When lemon is added to milk, it curdles. Can you outline the reasons for the same and the factors affecting? | CO4 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Outline the steps involved in the manufacture of Fructose corn syrup discussing in detail on the steps involved. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Give reasons for the following –  (i). It is better to wash leafy vegetables and cut rather than doing the other way  (ii) Lemon juice should not be stirred for long. | CO6 | An | 6 |
|  | b. | Outline the principle behind the estimation of Vitamin C using Tillman’s dye. | CO2 | U | 2 |
|  | c | If the standardization reading of the same experiment is 4 mL and that of the sample taken (5 ml taken) is 4 mL, determine the ascorbic acid content 100 mL of the given sample | CO2 | An | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Outline the changes that take place when –   1. HCl is added to grape juice extract 2. HCl is added to green leafy vegetable extract 3. NaOH added to brinjal extract. 4. Cooking of lycopene | CO 5 | A | 4x3 = 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Name and describe the general chemical structures of major components of foods (water, proteins, carbohydrates, and lipids) and selected minor components (vitamins and minerals). |
| CO2 | Understand, plan, perform and analyse a range of chemical investigations with emphasis on food analysis. |
| CO3 | Relate the chemical composition of foods to their functional properties. |
| CO4 | Examine a molecular rationalization for the observed physical properties and reactivity of major food components. |
| CO5 | Predict how changes in overall composition are likely to change the reactivity of individual food components. |
| CO6 | Evaluate and determine the approaches that may be used to control the reactivity of those food components that are likely to impact the overall quality of finished products. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 16 | 1 | 4 |  |  | 26 |
| CO2 | 1 | 11 | 27 |  |  |  | 39 |
| CO3 | 4 | 6 |  |  |  |  | 10 |
| CO4 | 1 |  | 9 |  |  |  | 10 |
| CO5 |  |  | 27 |  |  |  | 27 |
| CO6 | 3 | 3 |  | 6 |  |  | 12 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2004** | **Duration** | **3hrs** |
| **Course Name** | **FLUID MECHANICS FOR FOOD PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Distinguish between fundamental units and secondary units. | | CO1 | An | 1 |
| 2. | Interpret the term bulk modulus. | | CO1 | U | 1 |
| 3. | Define Centre of pressure. | | CO2 | R | 1 |
| 4. | State Archimedes’ principle. | | CO1 | R | 1 |
| 5. | Indicate the forces used for developing Reynolds equation of motion. | | CO3 | U | 1 |
| 6. | Appraise the applications Bernoulli’s equation. | | CO3 | R | 1 |
| 7. | Justify the significance of minor losses in short and long pipes. | | CO4 | E | 1 |
| 8. | Write any two laws by Froude for finding frictional resistance for turbulent flow. | | CO4 | U | 1 |
| 9. | Define coefficient of contraction. | | CO5 | R | 1 |
| 10. | Classify the orifices based on their cross sectional areas. | | CO5 | An | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Calculate the capillary rise in a glass tube of 2.5 mm diameter, when immersed vertically in a) water b) mercury. Take surface tension σ = 0.0725 N/m for water and σ = 0.52 N/M for mercury in contact with air. The specific gravity of mercury is given as 13.6 and angle of contact is 130º. | | CO1 | An | 3 |
| 12. | The velocity potential function is given by ɸ = 5(x2-y2). Calculate the velocity at the points (4,5) | | CO3 | U | 3 |
| 13. | A pitot static tube placed in the center of a 300mm pipe line has one orifice pointing upstream and the other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60mm of water. Take the coefficient of pitot tube as Cv=0.98. | | CO5 | An | 3 |
| 14. | A sphere of diameter 2mm falls 150mm in 20 seconds in a viscous liquid. The density of the sphere is 7500 kg/m3 and of liquid is 900 kg/m3. Find the coefficient of viscosity of the liquid. | | CO1 | U | 3 |
| 15. | Illustrate how water hammer occurs in a pipe flow. | | CO4 | An | 3 |
| 16. | Explain the experimental determination of Coefficient of Discharge (Cd) | | CO5 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Establish an expression for finding difference of pressure in an inverted U tube manometer. | CO2 | Ap | 6 |
|  | b. | Water is flowing through two different pipes to which an inverted differential manometer having an oil of Sp. gr 0.8 is connected. The pressure head in the pipe A is 2m of water, find the pressure in the pipe B for the manometer readings as shown in the figure. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 18. | a. | Consider a plane vertical surface of arbitrary shape is immersed in a liquid. Discuss how will you determine the total pressure and center of pressure of a submerged plane. | CO3 | U | 8 |
|  | b. | Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of Sp.gr.0.9. The base of the plate coincides with the free surface of oil. | CO3 | Ap | 4 |
|  |  |  |  |  |  |
| 19. |  | State the Bernoulli’s theorem. Derive Bernoulli’s equation from Euler’s equation and mention the assumptions of Bernoulli’s equation. | CO4 | Ap | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the any one of the methods of determination of coefficient of viscosity with a neat sketch. | CO1 | An | 6 |
|  | b. | The viscosity of an oil of sp.gr. 0.9 is measured by a capillary tube of diameter 50mm. the difference of pressure head between two points 2m apart is 0.5m of water. The mass of oil collected in a measuring tank is 60kg in 100 seconds. Find the viscosity of oil. | CO1 | Ap | 6 |
|  |  |  |  |  |  |
| 21. | a. | Analyze the flow behavior of a liquid using Reynolds experiment. | CO4 | An | 5 |
|  | b. | The difference of water surface levels in two tanks, which are connected by three pipes in series of lengths 300mm, 200mm and 400mm respectively, is 12 m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 and 0.0048 respectively, considering i) minor losses ii) neglecting minor losses. | CO4 | E | 7 |
|  |  |  |  |  |  |
| 22. | a. | The time period (t) of a pendulum depends upon the length (KL) of the pendulum and acceleration due to gravity (g). derive an expression for the time period. | CO6 | C | 8 |
|  | b. | Express the formula for finding i) Froude’s number ii) Euler’s number iii) Weber’s number. | CO6 | U | 4 |
|  |  |  |  |  |  |
| 23. | a. | Deduce an expression for the loss of head due to sudden enlargement. | CO4 | An | 7 |
|  | b. | Find the head lost due to friction in a pipe of diameter 300mm and length 50m, through which water is flowing at a velocity of 3 m/s using  i) Darcy’s formula ii) Chezy’s formula for which C=60. Take v for water = 0.01 stoke. | CO4 | E | 5 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Rewrite the derivation for finding flow through large orifices. | CO5 | U | 6 |
|  | b. | A circular tank of diameter 4 m contains water up to a height of 5m. The tank is provided with an orifice of diameter 0.5 m at the bottom. Find the time taken by water i) to fall from 5m to 2m ii) for completely emptying the tank. Take Cd = 0.6. | CO5 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| **CO1** | Recognize the various properties of fluids. |
| **CO2** | Identify the various methods of pressure measurement. |
| **CO3** | Calculate the forces acting on bodies submerged in different positions in liquids. |
| **CO4** | Point out the type of flow of fluid and quantify the fluid flow through pipes. |
| **CO5** | Measure the quantity of fluid flow. |
| **CO6** | Create solutions for problems in dimensional analysis. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 | 6 | 10 |  |  | 21 |
| CO2 | 1 |  | 6 |  | 6 |  | 13 |
| CO3 | 1 | 12 | 4 |  |  |  | 17 |
| CO4 |  | 4 | 12 | 12 | 13 |  | 41 |
| CO5 | 1 | 9 |  | 10 |  |  | 20 |
| CO6 |  | 4 |  |  |  | 8 | 12 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2006** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED FOOD MICROBIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Quote the bacterium that was first isolated from coagulated milk. | | CO1 | R | 1 |
| 2. | Give an example for shellfish pathogen. | | CO1 | U | 1 |
| 3. | Name the bacterium that produces acetic acid. | | CO2 | R | 1 |
| 4. | Identify any two pathogenic bacteria that are of more concern in dairy industry. | | CO2 | U | 1 |
| 5. | Predict the bacterium that is found in anaerobically stored meats. | | CO3 | U | 1 |
| 6. | Locate the thermophilic anaerobe that causes spoilage in canned foods. | | CO3 | R | 1 |
| 7. | Recognize the fungi that produces the aflatoxin. | | CO4 | R | 1 |
| 8. | Cite the toxin produced by *Bacillus cereus.* | | CO4 | U | 1 |
| 9. | Give an example for Class I presevatives. | | CO5 | U | 1 |
| 10. | Expand ELISA. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | State any three important physiological characteristics of mold. | | CO1 | R | 3 |
| 12. | Articulate the potential benefits of probiotics. | | CO2 | A | 3 |
| 13. | Predict the qualities of an ideal starter culture. | | CO3 | A | 3 |
| 14. | Recall the mechanism of action of botulinum toxin. | | CO4 | R | 3 |
| 15. | Classify Pasteurization methods. | | CO5 | An | 3 |
| 16. | Write the objective of RPLA method. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Recite the scientific contributions of the following:   1. Louis Pasteur 2. Francesco Redi 3. Robert Koch 4. Alexander Fleming | CO1 | R | 12 |
| 18. | a. | Identify the types of starter cultures involved in fermentation of dairy products. | CO2 | U | 4 |
|  | b. | Define Lactic acid fermentation. Illustrate the process of sauerkraut production with a special mention about the spoilage defects. | CO2 | A | 8 |
| 19. | a. | Evaluate the spoilage of fermented food products. Highlight the causative agent that affects the fermented food. | CO3 | An | 6 |
|  | b. | Report the reasons for spoilage of meat with respect to causative agent. | CO3 | U | 6 |
| 20. |  | Differentiate exotoxin and endotoxin. Write short notes on:  a) Aflatoxin  b) Botulinum toxin  c) Algal toxins | CO4 | U | 12 |
| 21. |  | Develop a process flow diagram for canning of fruits. Add a note on spoiled cans. | CO5 | A | 12 |
| 22. |  | Illustrate the production process of semidry sausages with a neat block diagram. Highlight the fermentation and Microbiology of sausage in detail. | CO3 | A | 12 |
| 23. |  | Appraise the importance of high-pressure processing of foods with a special mention about the applications. | CO4 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Define PCR. Design a process flow to detect the bacteria from spoiled foods. | CO6 | C | 8 |
|  | b. | Write any four applications of Biosensors. | CO6 | A | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the characteristics, sources and significance of predominant food microorganisms. |
| CO2 | Understand food spoilage by microorganisms and the strategies implemented to prevent spoilage. |
| CO3 | Relate beneficial microorganisms to their role in fermentation of foods. |
| CO4 | Distinguish thermal and non-thermal mode of preservation of foods. |
| CO5 | Evaluate the food borne pathogens associated with intoxication and infections |
| CO6 | Create food safety protocols. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 1 | - | - | - | - | 17 |
| CO2 | 1 | 5 | 11 | - | - | - | 17 |
| CO3 | 1 | 7 | 15 | 6 | - | - | 29 |
| CO4 | 4 | 13 | - | - | 12 | - | 29 |
| CO5 | 1 | - | 12 | 3 | - | - | 16 |
| CO6 | 1 | 3 | 4 | - | - | 8 | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FP2008** | **Duration** | **3hrs** |
| **Course Name** | **METABOLISM AND NUTRITION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Expand HMP. | | CO1 | R | 1 |
| 2. | Expand NAD. | | CO1 | R | 1 |
| 3. | Cite an example for an unsaturated fatty acid. | | CO4 | R | 1 |
| 4. | Calculate the number of acetyl CoA molecules generated during the breakdown of Palmitoyl CoA to Myristyl CoA. | | CO4 | U | 1 |
| 5. | List out any one acidic amino acid present in nature. | | CO1 | R | 1 |
| 6. | \_\_\_\_\_\_\_\_is an example for a pyrmidine base. | | CO4 | R | 1 |
| 7. | The calorific value of 2g of oil is \_\_\_\_\_ | | CO2 | A | 1 |
| 8. | Expand PEN. | | CO2 | R | 1 |
| 9. | Recall the enzyme inhibitor found in cotton seed. | | CO5 | R | 1 |
| 10. | Nutrition designed for infants is also called \_\_\_\_\_\_\_\_\_\_. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Outline the steps involved in the formation of pyruvic acid of 1,3-diphospho glycerate. | | CO3 | U | 3 |
| 12. | “First step in fatty acid synthesis is the formation of malonyl CoA” – Explain. | | CO4 | A | 3 |
| 13. | Tyrosine is biosynthesized from phenyl alanine – Justify. | | CO2 | U | 3 |
| 14. | Briefly outline the method for determination of Biological value of a protein. | | CO5 | U | 3 |
| 15. | Differentiate between food supplementation and food fortification. | | CO3 | A | 3 |
| 16. | Briefly outline the method of inactivation of trypsin inhibitor. | | CO3 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Enlist the steps involved in the Non-oxidative phase of HMP shunt. | CO3 | U | 8 |
|  | b. | Discuss briefly on acyl phosphates in metabolic pathways. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Explain the reactions involved in the conversion of acetyl CoA to butyryl CoA. | CO4 | A | 6 |
|  | b. | Explain the formation of α–ketoglutarate in the Kreb’s cycle. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Ornithine is generated from citrulline during the ornithine cycle – Criticize with suitable explanation. | CO4 | U | 8 |
|  | b. | Outline the steps involved in the synthesis of Serine. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 20. | a. | Discuss in detail the steps involved in the oxidation of palmitoyl CoA to Lauryl CoA. | CO4 | U | 6 |
|  | b. | Enlist the steps involved in the synthesis of Mevalonic acid from acetyl CoA. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 21. |  | Briefly outline the steps involved in the breakdown of the following amino acids – a. Arginine b. Tyrosine c. Methionine. | CO4 | U | 3X4 = 12 |
|  |  |  |  |  |  |
| 22. | a. | Miss M seeks your help in understanding nutritional epidemiology with particular reference to a. BMI and b.Clinical tests. Can you help her? | CO3 | A | 2X3 = 6 |
|  | b. | M/s. Healtho – a company involved in formulating health mix is seeking your help in labelling their product. Can you help them? | CO3 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Discuss on the My pyramid concept. | CO5 | U | 6 |
|  | b. | Discuss briefly on the following – a. Lectins b. Phytates. | CO5 | A | 2x3 = 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | M/s. Infanto seeks your help in developing a premix for pregnant women. Discuss in detail the steps involved in formulating the mix, highlighting the importance of each of the raw materials you want to suggest. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the structure of ATP and the major class of macromolecules to which ATP belongs. |
| CO2 | Describe the biochemistry process, basic concept of human nutrition and the relationship of the consumption of foods to nutritional status and health. |
| CO3 | Apply their knowledge in food biochemistry and nutrition in designing new range of products with improved nutritional characteristics (Nutraceuticals and functional foods). |
| CO4 | Analyze the stages in catabolism of food molecules and describe what occurs during each stage. |
| CO5 | . Evaluate the biological functions of foods for health in addition to nutritional value. |
| CO6 | Formulate specialized nutrition for pediatric, geriatric and sport’s needs. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 3 | 4 |  |  |  |  | 7 |
| CO2 | 1 | 3 | 1 |  |  |  | 5 |
| CO3 |  | 3+4 | 3+3+12 |  |  |  | 25 |
| CO4 | 1+1 | 1+6+8+6+12 | 3+6 |  |  |  | 44 |
| CO5 | 1 | 3+8+6+6 | 6 |  |  |  | 30 |
| CO6 | 1 |  | 12 |  |  |  | 13 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2010** | **Duration** | **3hrs** |
| **Course Name** | **PROCESS ENGINEERING THERMODYNAMICS** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Describe extensive property. | | CO1 | U | 1 |
| 2. | A liquid of mass 18 kg is heated from 25°C to 85°C. How much heat transfer is required? Assume Cp of liquid as 4.2 kJ/kg K. | | CO1 | A | 1 |
| 3. | Relate the entropy of liquid and gas. | | CO2 | U | 1 |
| 4. | Differentiate COP and efficiency. | | CO2 | U | 1 |
| 5. | Define Priming of steam. | | CO3 | R | 1 |
| 6. | Recognize Critical point in phase diagram. | | CO3 | R | 1 |
| 7. | Report the conditions for an ideal solution. | | CO4 | A | 1 |
| 8. | State Lewis Randall rule. | | CO4 | U | 1 |
| 9. | Determine the state of steam at a pressure of 12 bar with its specific volume of 0.175 m3/kg. | | CO5 | A | 1 |
| 10. | Reproduce Dew Point Depression. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Interpret Joule Thompson coefficient. | | CO1 | A | 3 |
| 12. | In a steady flow of air through a nozzle, the enthalpy decreases by 50 kJ between two sections. Assuming that there is no other energy changes than the kinetic energy, determine the increase in velocity at section 2, if the initial velocity is 90 m/s. | | CO2 | A | 3 |
| 13. | Explain the need for pressure correction factor in Vander Waals equation. | | CO3 | An | 3 |
| 14. | Summarize Hendry’s law for dilute solutions. | | CO4 | U | 3 |
| 15. | Find the specific volume and enthalpy of steam at 9 bar when the condition of the steam is i) wet with dryness fraction 0.98 ii) dry saturated. | | CO5 | A | 3 |
| 16. | Dry bulb and wet bulb temperatures of 1 atmospheric air stream are 40°C and 30°C respectively. Determine i. Humidity ratio ii. Relative humidity iii. specific enthalpy. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | 5Kg of air at 40°C and 1 bar is heated in a reversible non-flow constant pressure until the volume is doubled. Find i. change in volume ii. Work done iii. Change in internal energy iv. Change in enthalpy. | CO1 | A | 12 |
|  | | | | | |
| 18. | a. | Define work. | CO1 | R | 2 |
| b. | Justify work as a path function with suitable example. | CO1 | E | 10 |
|  | | | | | |
| 19. | a. | Compare and contrast Carnot and reversed Carnot Cycle. | CO2 | An | 8 |
| b. | Deduce the expression for final velocity for Nozzle from Steady Flow Energy Equation. | CO2 | An | 4 |
|  | | | | | |
| 20. | a. | At the inlet of the nozzle, the enthalpy and the velocity of the fluid are 3000 kJ/kg and 50 m/s respectively. There is negligible heat loss from the nozzle. At the outlet of the nozzle, enthalpy is 2450 kJ/kg. If the nozzle is horizontal, find the velocity of the fluid at the exit. | CO2 | A | 8 |
| b. | Compare COP of refrigerator and heat pump with line diagram. | CO2 | U | 4 |
|  | | | | | |
| 21. |  | Develop Maxwell’s thermodynamic relations based on Helmholtz and Gibbs Free energy. | CO3 | C | 12 |
|  | | | | | |
| 22. |  | Explain partial molar properties with suitable example. | CO4 | An | 12 |
|  | | | | | |
| 23. |  | Summarize the process of steam formation at constant pressure with suitable line diagram. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Atmospheric air at a pressure of 1 bar and 25°C has a relative humidity of 75%. Find i. Partial pressure of water vapor and air ii. Specific volume. Water vapor condensed per kg of dry air when the mixture is cooled a constant pressure to a temperature of 10°C. | CO6 | A | 7 |
|  | b. | Explain cooling and dehumidification process with neat diagram. | CO6 | U | 5 |

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|  | **COURSE OUTCOMES** |
| CO1 | Examine thermodynamic quantities for various systems. |
| CO2 | Explain various laws of thermodynamics related to food processing. |
| CO3 | Calculate the properties of pure fluids. |
| CO4 | Differentiate the properties of a component in a mixture. |
| CO5 | Choose the properties of steam generated for food application. |
| CO6 | Integrate the properties of air and water vapor system for food processing. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 1 | 16 | --- | 10 | --- | 29 |
| CO2 | --- | 6 | 11 | 12 | --- | --- | 29 |
| CO3 | 2 | --- | --- | 3 | --- | 12 | 17 |
| CO4 | --- | 4 | 1 | 12 | --- | --- | 17 |
| CO5 | --- | 12 | 4 | --- | --- | --- | 16 |
| CO6 | 1 | 5 | 10 | --- | --- | --- | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2011** | **Duration** | **3hrs** |
| **Course Name** | **DAIRY PROCESS ENGINEERING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Quote the percentage of fat in skim milk. | | CO1 | R | 1 |
| 2. | Cite any one milk quality control test used to determine heat stability. | | CO2 | U | 1 |
| 3. | Write full form of FDV. | | CO3 | C | 1 |
| 4. | Point out the function of UV tube in Form Fill Seal machine. | | CO3 | An | 1 |
| 5. | Indicate the fat soluble vitamins present in cream. | | CO1 | U | 1 |
| 6. | What is the temperature of milk before it is subjected to clarification? | | CO2 | R | 1 |
| 7. | Write the percentage of Moisture in Table Butter as per FSSAI. | | CO2 | E | 1 |
| 8. | Point out the acid producing starter culture used for ripening of cream during butter manufacture. | | CO2 | An | 1 |
| 9. | Name any stabilizer used in ice cream mixes. | | CO2 | R | 1 |
| 10. | Recall the equipment used to spray the feed as fine droplets into a drying chamber. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the factors affecting composition of milk. | | CO1 | R | 3 |
| 12. | Explain the types of LTLT pasteurizers. | | CO6 | U | 3 |
| 13. | Describe the theories of homogenization. | | CO3 | U | 3 |
| 14. | Summarize the classification of butter based on the end use. | | CO2 | U | 3 |
| 15. | List Factors for selecting stabilizers for ice cream. | | CO2 | R | 3 |
| 16. | What are the Advantages and limitations of different membranes used in R.O. and U.F. | | CO4 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. |  | Explain the constituents of milk. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain on recirculation system of CIP. | CO4 | U | 6 |
|  | b. | Classify the types of LTLT Pasteurizers. | CO6 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | What is the effect of homogenization on physicochemical properties of milk? | CO3 | R | 6 |
|  | b. | Describe the characteristics of gravity and centrifugal methods of cream separation. | CO6 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Explain the theories of churning of butter and also give the flow diagram for cream preparation and butter manufacturing. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain different kinds of Ice cream. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Tabulate quality control test for milk along with their significance. | CO2 | R | 6 |
|  | b. | Differentiate between cold and warm milk clarification. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 23. |  | Describe the process of manufacturing cottage cheese with the help of flow chart. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Summarize different types of membrane techniques used in dairy industries. | CO4 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge on the physio-chemical properties of milk and milk constituents. |
| CO2 | Understand the various milk processing methods and technologies. |
| CO3 | Apply the knowledge of engineering principles involved in different unit operations in the formulation and processing of milk and milk products. |
| CO4 | Analyze the engineering and technological problems in dairy processing lines reaching substantiated solution or conclusion. |
| CO5 | Evaluate the working of dairy equipments used in the dairy plant. |
| CO6 | Design operations and equipments for dairy processing. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 1 | -- | -- | 12 | -- | 17 |
| CO2 | 11 | 4 | -- | 1 | 1 | -- | 17 |
| CO3 | 8 | 27 | -- | 19 | -- | 1 | 55 |
| CO4 | 3 | 18 | -- | -- | -- | -- | 21 |
| CO5 | 1 | -- | -- | -- | -- | -- | 1 |
| CO6 | -- | 7 | -- | 6 | -- | -- | 13 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2012** | **Duration** | **3hrs** |
| **Course Name** | **UNIT OPERATIONS IN FOOD PROCESSING - I** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define the term aperture. | | CO1 | R | 1 |
| 2. | Indicate the methods to designate openings in wired mesh. | | CO1 | A | 1 |
| 3. | Convert 18% wet basis moisture content to dry basis moisture content. | | CO3 | U | 1 |
| 4. | State the principle of moisture determination by electrical resistance method. | | CO3 | R | 1 |
| 5. | Define crushing efficiency. | | CO4 | R | 1 |
| 6. | Express the assumption of Bond’s Law. | | CO4 | U | 1 |
| 7. | Write any two criteria for the choice of filter medium. | | CO2 | A | 1 |
| 8. | Recall the forces acting on a particle moving in a fluid. | | CO2 | R | 1 |
| 9. | Appraise the significance of ‘g’ number in centrfugation. | | CO5 | An | 1 |
| 10. | Compare and contrast sedimentation and centrifugation process. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Calculate the effectiveness of the screen if E = 0.84, F = 0.49 and G = 0.18. | | CO1 | A | 3 |
| 12. | Demonstrate the brown Dual method of moisture determination. | | CO3 | U | 3 |
| 13. | Grinding studies on Maize grains was carried out in a hammer mill operating on 373 watts. The initial particle size is 4.22 mm and the desired final particle size is 0.4 mm. The Bonds work index was reported to be 0.1172 kWh/kg. What should be the hourly flow rate of the feed grain? | | CO6 | E | 3 |
| 14. | A bowl centrifuge is used to separate a solid suspension. The centrifuge has discharge radii of 8 cm and 10 cm. If the density of solids is 1050 kg/m3, and the mother liquid is water, calculate the neutral zone so that the feed inlet may be designed. | | CO4 | A | 3 |
| 15. | List out the various applications of centrifugation in food industries. | | CO2 | R | 3 |
| 16. | A nutraceutical formulation of 1 kg is mixed with 999 kg of a food. After mixing five samples each of 100 grams are collected and analyzed for nutraceuticals. The following are the results of each sample in grams:  0.11, 0.098, 0.09, 0.105, 0.12.  Find the standard deviation and variance. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the working of pneumatic and aspirator separator with a diagram. | CO1 | An | 6 |
|  | b. | Examine the working of a color separator with a neat sketch. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Interpret the drying theory with the help of drying rate periods. | CO3 | U | 5 |
|  | b. | Determine the values of the constants C and n of Henderson’s equation for the following data obtained from thin layer paddy drying studies.   |  |  |  |  | | --- | --- | --- | --- | | Condition | Relative Humidity, % | Temperature, ºC | EMC% (db) | | 1 | 70 | 30 | 9 | | 2 | 20 | 40 | 5 | | CO3 | A | 7 |
|  |  |  |  |  |  |
| 19. | a. | The results of 25 g of maize grinding and sieve analysis report are given below. i) Calculate the average particle size ii) Find the aperture through which 80% of the material passes.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Mesh size** | **10** | **20** | **28** | **35** | **48** | **65** | **100** | **100** | | **Avg. opening (mm)** | **1.651** | **1.342** | **0.711** | **0.503** | **0.356** | **0.251** | **0.178** | **0.147** | | **Quantity(g)** | **1.977** | **11.693** | **4.508** | **1.199** | **2.428** | **0.63** | **1.095** | **1.47** | | CO1 | E | 8 |
|  | b. | Express the principle and laws of size reduction. | CO6 | U | 4 |
|  |  |  |  |  |  |
| 20. | a. | Derive an expression for constant rate and constant pressure filtration process. | CO2 | C | 6 |
|  | b. | Describe the construction and working of continuous rotary drum filter press. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the principle of centrifugation and deduce an equation for finding velocity of a particle in centrifugation process. | CO5 | An | 6 |
|  | b. | Illustrate the working principle of Tubular bowl and basket type centrifuges. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Describe the working of sedimentation equipment. | CO4 | R | 5 |
|  | b. | Determine the total time required for drying of food sample using the data given below:  The initial moisture content = 25 % (wet basis)  Final moisture content = 6% (wet basis)  Weight of dry solids (Wd) = 159 kg  Weight of dry solids per unit drying area = 39 kg/m2  Moisture content at the end of constant rate period (XC) = 0.2 kg moisture / kg of dry solids.  Rate of drying at the end of constant rate period (RC) =1.461 kg/m2 hr  Rate of drying at the end of falling rate period(R2) = 0.075 kg/m2 hr | CO3 | A | 7 |
|  |  |  |  |  |  |
| 23. | a. | A centrifuge is used for separation of an oil emulsion in water. The oil is dispersed in water in the form of fine globules of average diameter 50 µ, and the oil has a density of 900 kg/m3. The centrifuge rotates at 2000 rpm. The effective radius at which the separation takes place is 40 mm. Calculate the velocity of oil globules in the water medium. If the flow rate of feed is 100 Lpm, find the Sigma factor of the centrifuge. | CO5 | E | 6 |
|  | b. | Prioritize the need for LSU dryer and explain its working with a neat diagram. | CO3 | E | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Analyze the working of various mixing equipments and list the applications of mixing in food industry. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the applications of mechanical separation in food materials. |
| CO2 | Understand the various unit operations performed in food processing. |
| CO3 | Analyze the principle and operation of different types of dryers and understanding the drying of principles. |
| CO4 | Apply knowledge of unit operations into choice of equipments for processing. |
| CO5 | Evaluate the efficiency of equipments used in unit operations of foods. |
| CO6 | Design equipments for screening, grading, drying, size reduction, mechanical separation and mixing of foods. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 0 | 16 | 6 | 8 | 0 | 31 |
| CO2 | 4 | 0 | 1 | 0 | 0 | 6 | 11 |
| CO3 | 1 | 9 | 14 | 0 | 7 | 0 | 31 |
| CO4 | 12 | 1 | 3 | 0 | 0 | 0 | 16 |
| CO5 | 0 | 1 | 0 | 7 | 5 | 0 | 13 |
| CO6 | 0 | 4 | 0 | 15 | 3 | 0 | 22 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2014** | **Duration** | **3hrs** |
| **Course Name** | **FRUIT AND VEGETABLE PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define Maturity indices. | | CO1 | R | 1 |
| 2. | Justify “Internal cork formation” in apple. | | CO2 | E | 1 |
| 3. | Name the type of fruits containing one large pit or seed. | | CO1 | R | 1 |
| 4. | List out any two types of grading machines for fruits. | | CO3 | R | 1 |
| 5. | Point out the Fungi responsible for Downy mildew. | | CO4 | An | 1 |
| 6. | List few examples of Dried fruit product. | | CO6 | R | 1 |
| 7. | Identify the device used to determine the specific gravity of material. | | CO3 | A | 1 |
| 8. | Indicate the amount of carbon dioxide present in carbonated Beverages. | | CO4 | U | 1 |
| 9. | Write the other name for Hurdle Technology. | | CO4 | R | 1 |
| 10. | Name the common gases used in MAP. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Recall Ethylene biosynthesis process. | | CO1 | R | 3 |
| 12. | Enlist the stages in fruit development. | | CO1 | R | 3 |
| 13. | Indicate the principle behind sugar as preservative in juice. | | CO2 | U | 3 |
| 14. | Recall the can seaming operation. | | CO3 | R | 3 |
| 15. | Write short note on metabolic exhaustion in microorganisms. | | CO2 | R | 3 |
| 16. | Write short note on gases used in MAP. | | CO5 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss the Strategies adopted for post-harvest loss in fruits and vegetables. | CO1 | U | 8 |
|  | b. | Summarize chilling injury mechanism in fruits. | CO1 | E | 4 |
|  |  |  |  |  |  |
| 18. |  | Explain the wet cleaning and dry cleaning methods. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Summarize the types of swelling spoilage in cans. | CO3 | E | 8 |
|  | b. | Write short note on single stage extractor. | CO3 | R | 4 |
|  |  |  |  |  |  |
| 20. | a. | Discuss the problems associated with jelly making. | CO4 | U | 9 |
|  | b. | Differentiate between Jam, Jelly and Marmalade. | CO4 | U | 3 |
|  |  |  |  |  |  |
| 21. | a. | Point out the mechanism of hurdle technology. | CO5 | An | 8 |
|  | b. | Explain principle of pulse electric field used for preservation of fruits and vegetables. | CO5 | An | 4 |
|  |  |  |  |  |  |
| 22. | a. | Discuss the advantages of aseptic processing. | CO3 | U | 4 |
|  | b. | Illustrate the Canning process. | CO3 | U | 5 |
|  | c. | Justify the statement “Metal cans are preferred for canning”. | CO3 | C | 3 |
|  |  |  |  |  |  |
| 23. |  | Recall the different methods used for preservation of juices. | CO4 | R | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Compute the salient features of AGMARK and ISO22000. | CO2 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Observe the production status and post-harvest handling methods of fruits and vegetables. |
| CO2 | Understand the methods of processing and preservation of freshly harvested and cut fruits and vegetables. |
| CO3 | Apply their knowledge of unit operations to pick specific heat treatment for processing and preservation of fruits and vegetables. |
| CO4 | Analyze the various production and preservation methods of fruit juices. |
| CO5 | Evaluate the dehydration methods and aseptic technologies used in fruit and vegetable processing. |
| CO6 | Design of driers used for drying fruit and vegetables. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 8 | - | - | 4 | - | 20 |
| CO2 | 3 | 3 | 12 | - | 1 | - | 19 |
| CO3 | 8 | 9 | 1 | 12 | 8 | 3 | 41 |
| CO4 | 13 | 13 | - | 1 | - | - | 27 |
| CO5 | 4 | - | - | 12 | - | - | 16 |
| CO6 | 1 | - | - | - | - | - | 1 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2015** | **Duration** | **3hrs** |
| **Course Name** | **FOOD ADDITIVES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Statement 1: Preservatives are food additives.  Statement 2: Sweeteners consist of calorie, low-calorie and non-calorie sweeteners.  a) True, False b) True, True c) False, False d) False, True | | CO1 | U | 1 |
| 2. | NOAEL stands for \_\_\_\_\_  a) Net observed adverse effect level  b) No observed adverse effect level  c) Negative order adverse effect log  d) Not observed adverse effect levels | | CO1 | R | 1 |
| 3. | \_\_\_\_\_ help in maintaining/controlling the acidic/alkaline range during food processing and hence maintain flavor and stability.  a) Acidulants b) Sequestrants c) Stabilizers  d) Anti-foaming agents | | CO2 | An | 1 |
| 4. | lactones are synthesized from \_\_\_\_\_\_\_  a) phosphoric acid b) acetic acid c) lactic acid d) adipic acid | | CO2 | A | 1 |
| 5. | \_\_\_\_\_\_\_\_ has capability of maturing dough and as well as bleaching it.  a) KIO3 b) Ca(IO3)2 c) CaO3 d) ClO2 | | CO3 | R | 1 |
| 6. | KIO3 exhibits \_\_\_\_\_\_\_\_\_\_ effect on higher intake  a) thyrostatic b) preservative c) humectant d) antioxidant | | CO3 | U | 1 |
| 7. | \_\_\_\_\_\_\_\_\_\_ among the following is non-permitted colour.  a) rhodamine b) brilliant blue CFC c) tartrazine d) ponceau | | CO4 | A | 1 |
| 8. | SO2 can’t be used in natural color juices because of \_\_\_\_\_\_  a) bitterness b) bleaching effect c) adverse reaction  d) pigmentation | | CO4 | An | 1 |
| 9. | TBHQ in oils helps to \_\_\_\_\_\_  a) enhances colour b) retards oxidation c) enhances flavour  d) none of the above | | CO5 | U | 1 |
| 10. | Propionates are effective against \_\_\_\_\_  a) yeast b) mould c) bacteria d) virus | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Can animal LD50 data be applied to humans? Justify. | | CO1 | A | 3 |
| 12. | What is acidulants and state the purpose of acidulants in food? | | CO2 | U | 3 |
| 13. | Define humectants. | | CO3 | An | 3 |
| 14. | What is meant by flavour enhancer? | | CO4 | A | 3 |
| 15. | Mention the significance of BHA in food processing. | | CO5 | U | 3 |
| 16. | Redefine non-enzymatic browning. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss importance of LD 50 and LC 50 in measure of acute toxicity, and How are LD/LC50 tests done? Also state limitations. | CO1 | U | 6 |
|  | b. | Define food additive as per codex alimentarius, and briefly state types of additives and applications. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate on the role of emulsifiers and gums in food processing. | CO2 | A | 6 |
|  | b. | Elucidate the role, principle, benefit and adverse effects of natural and artificial antioxidants. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the chemistry behind the flour improvers and permissible limits with examples. | CO3 | A | 6 |
|  | b. | Explain the role of humectants in various food category with examples. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Expound the toxicity data of the following colorants with industrial examples,   1. Natural colors. 2. Artificial colors. | CO4 | E | 6 |
|  | b. | Elaborate on the natural and artificial colours and possible side effects on children. | CO4 | E | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the methods to trace taste modifiers and its toxicity effects in food processing. | CO5 | An | 6 |
|  | b. | Describe the principle and types of fat substitutes and replacers. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Summarize the requirements, regulations and standards for natural and synthetic preservatives. | CO6 | A | 6 |
|  | b. | Appraise the role of ant browning agents, and explain the chemistry in preventing enzymatic browning and oxidation of food. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Substantiate the applications of natural and artificial chelating agents of food products. | CO5 | A | 6 |
|  | b. | Outline on the consumer protection act, 1986 and its implication of food product usage. | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | In dairy industry, homogeneous mixing of milk takes place naturally with a slight agitation force. This is because naturally emulsifier present in milk. This compounds reduces the surface tension between two immiscible phases and helps achieving homogenization and aeration. It also reduces stickiness, control crystallization and prevent separation.  Elucidate the emulsification mechanism of milk used in this case by distinguishing its hydrophilic and lipophilic parts with a neat sketch. | CO4 | An | 6 |
|  | b. | Assess the type of emulsion occurred in this case and compare that without emulsion with a neat sketch. | CO4 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of additives in maintaining or improving food quality. |
| CO2 | Understand the applications of food additives. |
| CO3 | Interpret the toxicity of food additives through NOAEl, ADI and LD 50 values. |
| CO4 | Distinguish the characteristics of additives and their specific use in foods. |
| CO5 | Evaluate the dietary intake of individuals consuming foods with food additives. |
| CO6 | Development of various instant premixes by addition of preservatives within the permissible limits |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 13 | 3 |  |  |  | 17 |
| CO2 |  | 3 | 13 | 1 |  |  | 17 |
| CO3 | 1 | 1 | 12 | 3 |  |  | 17 |
| CO4 |  |  | 4 | 13 | 12 |  | 29 |
| CO5 | 1 | 4 | 12 | 12 |  |  | 29 |
| CO6 |  |  | 12 | 3 |  |  | 15 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2017** | **Duration** | **3hrs** |
| **Course Name** | **MATERIAL SCIENCE FOR FOOD ENGINEERS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define unit cell. | | | CO3 | A | 1 |
| 2. | Elastic deformation cannot be caused by tension/ compression or shear forces. True/False | | | CO3 | A | 1 |
| 3. | Define fracture toughness and formula used to calculate fracture toughness. | | | CO5 | An | 1 |
| 4. | Draw a well labeled diagram of corrosion triangle. | | | CO4 | An | 1 |
| 5. | The negative ratio of the transverse strain to the longitudinal strain is called the ………………………. ratio | | | CO5 | A | 1 |
| 6. | Define creep. | | | CO3 | A | 1 |
| 7. | Sketch a simple cubic cell with primitive and interfacial angles. | | | CO4 | An | 1 |
| 8. | Give formula for: corrosion rate. | | | CO4 | An | 1 |
| 9. | Stress is dimensionless quantity. True/False | | | CO5 | A | 1 |
| 10. | Classify two types of fracture. | | | CO3 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define the match and the following terms with the correct option  - Shear stress: Force exerted on the body to Bend the body  - Torsion: Two sets of forces directed towards each other in same axis  - Bending: Nonflexible material breaks down on application of force  - Stiffness: The force experienced by body on twisting. | | | CO3 | An | 3 |
| 12. | Classify the types of stainless steel. | | | CO3 | A | 3 |
| 13. | Demonstrate with illustrations different types of stresses. | | | CO3 | An | 3 |
| 14. | State Bragg’s Law of X- ray diffraction. | | | CO6 | E | 3 |
| 15. | Define the hardenability and passivation. | | | CO3 | An | 3 |
| 16. | Illustrate the factors causing fatigue failure. | | | CO5 | E | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | Explain in detail the types of stress cycles with the help of well labeled graph. | CO3 | A | 6 |
|  | | b. | A wire 2 m long and 2 mm in diameter, when stretched by weight of 8 kg has its length increased by 0.24 mm. Find the stress, strain and Young’s modulus of the material of the wire.  (Note: g = 9.9.8 m/s2 | CO4 | An | 6 |
| 18. | |  | Explain “quenching” and the phases involved in the quenching process. Provide illustration wherever necessary. | CO3 | A | 12 |
| 19. | | a. | Describe in detail: Techniques used to prevent the corrosion. | CO3 | A | 6 |
|  | | b. | Write a note of primary, secondary and tertiary creep and explain it by appropriate graph. | CO4 | An | 6 |
| 20. | | a. | Compare Edge dislocation with screw dislocation. | CO4 | An | 6 |
|  | | b. | Distinguish between carbon steel and stainless steel. | CO3 | A | 6 |
| 21. | | a. | Write a note on Stress-Strain relationship with diagram and define the terms i. Proportional Limit ii. Ultimate strength and iii. Fracture strength based on the stress-strain curve. | CO5 | E | 6 |
|  | | b. | A mild steel wire of radius 0.5 mm and length 3m is stretched by a force of 49 N. Calculate a) longitudinal stress, b) longitudinal strain c) elongation produced in the body if Y=2.1 x 1011 N/m2. g = 9.8 m/s2. | CO4 | An | 6 |
| 22. | | a. | Explain basics of diffraction along with Constructive and Destructive Interference of Waves. | CO6 | C | 6 |
|  | | b. | Demonstrate with illustrations different types of stresses. | CO3 | A | 6 |
| 23. | |  | Classify types of corrosion on the basis of working Environment. Differentiate between the dry and wet corrosion. | CO3 | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | |  | Explain in detail “Sieving Method” for determining particle size. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO3 | Apply knowledge of alloying and developing alloyed material for food systems. |
| CO4 | Analyze materials to check for imperfections of metals. |
| CO5 | Evaluate and characterize metals. |
| CO6 | Design material manufacture techniques to develop materials for specific purposes. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | - | - | - | - |  |
| CO2 | - | - | - | - | - | - |  |
| CO3 | - | - | 55 | 9 | - | - | 64 |
| CO4 | - | - | - | 27 | - | - | 27 |
| CO5 | - | - | 2 | 1 | 9 | - | 12 |
| CO6 | - | - | 12 | - | 3 | 6 | 21 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2018** | **Duration** | **3hrs** |
| **Course Name** | **HEAT AND MASS TRANSFER** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | The driving force for heat transfer is --------- difference. | | CO1 | U | 1 |
| 2. | The measure of ability of the material to conduct heat is called --------. | | CO1 | R | 1 |
| 3. | The ratio of Cp.µ to K is called -------- number. | | CO2 | R | 1 |
| 4. | The rear edge in the boundary layer is called ---- edge. | | CO2 | R | 1 |
| 5. | The ratio of the inertial forces to the viscous forces is called -------. | | CO3 | U | 1 |
| 6. | When two fluid streams flow in opposite direction, such type of flow is called --------- flow. | | CO3 | R | 1 |
| 7. | In case of ----- boiling the vaporization takes place directly from the surface. | | CO4 | U | 1 |
| 8. | Heat can be transmitted by ----- mode across absolute vacuum. | | CO4 | R | 1 |
| 9. | Emissivity of any body is the ratio of its ------- to that of the black body at the same temperature. | | CO5 | U | 1 |
| 10. | The phenomena of molecular diffusion is explained by ------- law. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Interpret critical radius of insulation. | | CO1 | A | 3 |
| 12. | Describe momentum thickness in boundary layer. | | CO2 | U | 3 |
| 13. | Compare natural convection with forced convection. | | CO3 | R | 3 |
| 14. | Explain in brief the concept of black body. | | CO4 | An | 3 |
| 15. | Criticize the advantages of floating head heat exchanger. | | CO5 | E | 3 |
| 16. | State the Fick’s law of diffusion. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Derive an expression for heat flow through a thick-walled cylinder by conduction. Take r1 and r2 as the inner and outer radii of the cylinder, and k as the mean thermal conductivity. Assume T1 as the inside temperature and T2 as the outside temperature. | CO1 | An | 12 |
| 18. | a. | Evaluate displacement thickness and energy thickness for laminar flow over a flat plate | CO3 | E | 8 |
| b. | Summarize the different types of radiation surfaces. | CO3 | U | 4 |
| 19. | a. | Derive an expression for overall heat transfer coefficient when the heat flow takes place from the hot fluid to the cold fluid through a series of resistances. | CO4 | A | 10 |
| b. | State the temperature variation of the body with time during cooling. | CO2 | A | 2 |
| 20. | a. | At what wavelength, the monochromatic emissive power is maximum for a black body maintained at a temperature of 1300 K? | CO3 | E | 4 |
| b. | Compare and contrast Film wise and dropwise condensation | CO4 | An | 8 |
| 21. |  | Cold fluid is flowing through the heat exchanger at a rate of 15 m3/hr. It enters the heat exchanger at 303 K and leaves at 328 K. A hot thermic fluid enters the heat exchanger at a rate of 21 m3/hr. at a temperature of 388 K. Find the area of heat transfer required assuming the flow to be counter current and overall heat transfer coefficient to be 3490 W/m2K. Density of the cold fluid 1000 kg/m3. Density of the thermic fluid 950 kg/m3. Specific heat of cold fluid is 4.187 kJ/kg K and that of thermic fluid is 2.93 kJ/kg K. | CO5 | E | 12 |
| 22. |  | Show that in free convection the Nusselt number is a function of Grashoff number and Prandtl number. | CO2 | A | 12 |
| 23. | a. | It is necessary to insulate a flat surface so that the rate of heat loss per unit area of this surface does not exceed 450 W/m2. The temperature difference across the insulating layers is 400 K (127°C). Evaluate the thickness of insulation if (a) the insulation is made of asbestos cement having a thermal conductivity of 0.11 W/ (m.K), and (b) the insulation is made of fire clay having a thermal conductivity of 0.84 W/ (m·K). | CO1 | C | 8 |
| b. | Elaborate on the convection mode of heat transfer with examples. | CO2 | C | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Deduce a molar flux equation for a stagnant diffusion and equimolar counter diffusion process. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Calculate heat transfer rate by conduction through given geometry. | | | | | | | |
| CO2 | Evaluate the convective heat transfer coefficient for various flows. | | | | | | | |
| CO3 | Understand the role of radiation in heat transfer. | | | | | | | |
| CO4 | Assess the overall heat transfer rate in a heat exchanger. | | | | | | | |
| CO5 | Apply the principle of evaporation in food processing. | | | | | | | |
| CO6 | Relate to the concept of mass transfer in food processing | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 1 | 3 | 12 |  | 8 | 25 |
| CO2 | | 2 | 3 | 14 |  | 12 | 4 | 35 |
| CO3 | | 4 | 5 |  |  |  |  | 9 |
| CO4 | | 1 | 1 | 10 | 11 |  |  | 23 |
| CO5 | |  | 1 |  |  | 15 |  | 16 |
| CO6 | |  | 1 |  | 15 |  |  | 16 |
|  | | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FP2019** | **Duration** | **3hrs** |
| **Course Name** | **UNIT OPERATIONS IN FOOD PROCESSING -II** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Phenomenon in which solute present in gas phase diffuse into the bulk liquid is called as……………. | | | CO2 | U | 1 |
| 2. | Crystallization takes place at saturation – **True/False** | | | CO2 | U | 1 |
| 3. | Elaborate the various components of a single effect evaporator with a neat sketch. | | | CO2 | U | 1 |
| 4. | Solid that adsorb the component is known as ………………. | | | CO2 | U | 1 |
| 5. | Adsorption isotherm is graph between amount of adsorbate adsorbed on the surface of adsorbent (x/m) Vs Pressure at constant temperature. **True/False** | | | CO2 | U | 1 |
| 6. | Birth of the new crystals is known as …………….. | | | CO2 | U | 1 |
| 7. | **R/Q/E** line represent the feed section | | | CO2 | U | 1 |
| 8. | The unit operation “evaporation” is also known as concentration (**True/False**) | | | CO2 | U | 1 |
| 9. | When vapor pressure of the liquid equals the atmospheric pressure liquid ……………. | | | CO2 | U | 1 |
| 10. | Indicate the Lewis and Whitman two film theory in absorption. | | | CO2 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the three types of tower packing | | | CO2 | U | 3 |
| 12. | Classify evaporators | | | CO2 | U | 3 |
| 13. | Match  a) Adsorption a) Supersaturation  b) Absorption b) Unbalanced surface forces  c) Crystallization c) Bulk phenomenon | | | CO3 | An | 3 |
| 14. | Analyze the heat and mass balance in an evaporator with supporting equations. | | | CO4 | An | 3 |
| 15. | Match   1. Homogeneous Nucleation a) Microscopic crystals 2. Heterogenous nucleation b) Formation of new particles 3. Secondary nucleation c) Suspended particles | | | CO4 | A | 3 |
| 16. | Name the different types of Leaching/solid-liquid extraction equipment. | | | CO2 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | A solution with an initial solid concentration of 10% is being concentrated in a single effect evaporator to a final solid concentration of 40% under a vacuum of 40 kPa. The boiling point of the solution is negligible. Steam at a pressure of 101 kPa (gauge) is used to concentrate the liquor. The feed is entering at a temperature of 35⁰C and the temperature of the final liquor is 86⁰C corresponding to a vacuum of 40 kPa prevailing in the evaporator. If the feed rate is 1000 kg/h find the quantity of steam required and the heat transfer area of the evaporator. The specific heat of the feed which is reasonably constant is 5 kJ/kg⁰C, | CO6 | C | 6 |
|  | | b. | Discuss the principle of working, process and constraints in supercritical fluid extraction with a neat sketch. | CO3 | A | 6 |
|  | |  |  |  |  |  |
| 18. | | a. | Explain the McCabe Thiele method for estimation of required number of trays in a distillation column. | CO4 | An | 6 |
|  | | b. | Write a note on Freundlich adsorption Isotherm. | CO3 | A | 6 |
|  | |  |  |  |  |  |
| 19. | |  | **Numerical:** A single effect evaporator is required to concentrate a solution from 10% solids to 30% solids at the rate of 250 kg of feed per hour. If the pressure in the evaporator is 77 kPa absolute, and if steam is available at 200 kPa gauge, calculate the quantity of steam required per hour and the area of heat transfer surface if the overall heat transfer coefficient is 1700 J m-2 s-1 °C-1.  Assume that the temperature of the feed is 18°C and that the boiling point of the solution under the pressure of 77 kPa absolute is 91°C. Assume, also, that the specific heat of the solution is the same as for water, that is 4.186 x 103 J kg-1°C-1, and the latent heat of vaporization of the solution is the same as that for water under the same conditions.  From steam tables, the condensing temperature of steam at 200 kPa (gauge) [300 kPa absolute] is 134°C and latent heat 2164 kJ kg-1; the condensing temperature at 77 kPa (abs.) is 91°C and latent heat is 2281 kJ kg-1.  Mass balance (kg h-1)  Solids Liquids Total  Feed 25 225 250  Product 25 58 83  Evaporation 167 | CO3 | An | 12 |
|  | |  |  |  |  |  |
| 20. | | a. | **Numerical:** Define relative volatility. Calculate the vapor and liquid compositions in equilibrium at 95°C (368.2K) for benzene-toluene using the total vapor. As 101.32 kPa. Vapor pressure (PA) for benzene is 155.7 kPa and the vapor (PB) pressure for toluene as 63.3 kPa. Use the Raoult’s Law for Boiling point diagram. | CO4 | An | 6 |
|  | | b. | Draw schematics for ANY THREE types of evaporators labelling them appropriately. | CO3 | A | 6 |
|  | |  |  |  |  |  |
| 21. | | a. | **Design:** Explain the Distillation Column Modelling using material and component balances for over mass balance, top operating line and bottom operating line. Provide diagrams wherever necessary. | CO6 | C | 6 |
|  | | b. | **Numerical:** We have a 40 percent magnesium chloride solution in water at 20⁰C. Estimate the magnesium chloride crystallized out if the saturated concentration is only 54.5 kg/100 kg of water at 20⁰C. | CO5 | An | 6 |
|  | |  |  |  |  |  |
| 22. | | a. | **Numerical:** A calculation was made for a single-stage steam-stripping process to remove a taint from cream. The conditions were that stage-contact desorption was to be used to remove a taint that was present at a concentration of 10 ppm in the cream, by contact with a counter flow current of steam. Consider, now, the case of a rather more difficult taint to remove in which the equilibrium concentration of the taint in the steam is only 7.5 times as great as that in the cream. If the relative flow rates of cream and steam are given in the ratio 1: 0.75, how many contact stages would be required to reduce the taint concentration in the cream to 0.3 ppm assuming (a) 100% stage efficiency and (b) 70% stage efficiency? The initial concentration of the taint is 10 ppm. | CO5 | E | 6 |
|  | | b. | Interpret the three types of mechanical expression methods for oil. | CO4 | An | 6 |
|  | |  |  |  |  |  |
| 23. | | a. | Explain in detail the draft tube baffle crystallizer. | CO3 | U | 6 |
|  | | b. | Demonstrate the working of continuous counter current Bollman extractor. | CO3 | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Explain the food application of extrusion in detail. | CO2 | U | 6 |
|  | | b. | Illustrate and explain with the help of a diagram the working of a Twin screw extruder. | CO6 | C | 6 |

|  |  |
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|  | **COURSE OUTCOMES** |
| CO2 | Understand the principles of various unit operations used in food industries. |
| CO3 | Apply the knowledge of unit operations in mechanization of equipment’s for food industries. |
| CO4 | Analyze the requirements for successful operation of evaporators, extractors, extrusion, crystallization and distillatory units. |
| CO5 | Evaluate the efficiency of evaporators, extractors, extrusion, absorption, crystallization and distillatory units. |
| CO6 | Design and analyze evaporators, extractors, extrusion, absorption, crystallization and distillatory units for the food industries. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO2 |  | 25 |  |  |  |  | 25 |
| CO3 |  | 12 | 18 | 15 |  |  | 45 |
| CO4 |  |  | 3 | 21 |  |  | 24 |
| CO5 |  |  |  | 6 | 6 |  | 12 |
| CO6 |  |  |  |  |  | 18 | 18 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2020** | **Duration** | **3hrs** |
| **Course Name** | **MILLING TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the objective of parboiling. | | CO2 | U | 1 |
| 2. | Define glazing. | | CO2 | R | 1 |
| 3. | Describe Semolina. | | CO3 | R | 1 |
| 4. | Select the by-products of wheat milling and their uses. | | CO2 | A | 1 |
| 5. | Pulses need to be conditioned before milling. Justify. | | CO1 | E | 1 |
| 6. | Indicate the significance of blanching soyabeans. | | CO1 | U | 1 |
| 7. | Recall the composition of corn. | | CO1 | R | 1 |
| 8. | Name the various solvents used in corn oil extraction process | | CO3 | R | 1 |
| 9. | Show the sections in the compression curve of a screw press. | | CO5 | U | 1 |
| 10. | Report the food uses of oil cake. | | CO3 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Indicate the steps involved in parboiling with a diagram. | | CO2 | U | 3 |
| 12. | Write flowchart for preheat process of bulgur production. | | CO3 | A | 3 |
| 13. | List the various unit operations involved in soyabean process and sketch the flow chart. | | CO5 | R | 3 |
| 14. | Illustrate a neat sketch of corn kernels and show the nutritional value of it. | | CO1 | An | 3 |
| 15. | Express the extraction process for coconut oil from fresh meat. | | CO5 | C | 3 |
| 16. | Construct a flow chart for manufacturing of millet flakes. | | CO4 | C | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Identify the different methods of parboiling and explain them. | CO2 | U | 6 |
|  | b. | Propose the steps in puffed rice manufacturing process. | CO3 | E | 6 |
| 18. |  | Explain the unit operations and milling equipment’s used in converting raw wheat into wheat flour. | CO5 | An | 12 |
| 19. | a. | Summarize the various unit operations involved in pulse milling. | CO5 | E | 6 |
|  | b. | Illustrate the flow chart for the production of soy paneer and flakes. | CO3 | A | 6 |
| 20. |  | Generalize the corn wet milling process in detail and list out the products of wet milling. | CO3 | U | 12 |
| 21. | a. | Examine the working of screw press used in oil extraction. | CO5 | An | 5 |
|  | b. | Write a note on soyabean oil extraction process with a diagram. | CO5 | A | 7 |
| 22. | a. | Appraise the construction and working of LSU dryer. | CO2 | E | 8 |
|  | b. | Describe the production process of noodles and pasta. | CO3 | R | 4 |
| 23. | a. | Elaborate the CFTRI method of pulse milling with its demerits and demerits. | CO3 | C | 6 |
|  | b. | Prioritize the Super Critical fluid extraction of corn oil with a neat diagram. | CO6 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the method of pearl millet processing. | CO4 | C | 6 |
|  | b. | Write a detailed note on the production of traditional millet-based products. | CO4 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge about the structure, composition and pre milling operations in processing of cereals, pulses and oil seeds. |
| CO2 | Understand about paddy processing and rice milling equipment which will help them for developing entrepreneurial skills. |
| CO3 | Apply the knowledge to process food grains into value added products. |
| CO4 | Analyze the suitable technique for milling of various millets. |
| CO5 | Evaluate the types of mills used for milling of cereals, pulses and oilseeds. |
| CO6 | Design layout for milling plants. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | - | 3 | 1 | - | 6 |
| CO2 | 1 | 10 | 1 | - | 8 | - | 20 |
| CO3 | 6 | 12 | 10 | - | 6 | 6 | 40 |
| CO4 | - | - | 6 | - | - | 9 | 15 |
| CO5 | 3 | 1 | 7 | 17 | 6 | 3 | 37 |
| CO6 | - | - |  | 6 | - | - | 6 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2021** | **Duration** | **3hrs** |
| **Course Name** | **FOOD STANDARDS AND REGULATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
|  | Recall the 3 recognized categories of food safety hazards. | | CO3 | R | 1 | |
|  | Rationalize the use of food additives in foods at specified maximum levels. | | CO4 | U | 1 | |
|  | Indicate the shade that “tartrazine” gives. | | CO2 | U | 1 | |
|  | Recognize the general stages in the supply chain of foodstuffs. | | CO2 | R | 1 | |
|  | Identify the ex-officio Chairperson of the Central Advisory Committee. | | CO1 | R | 1 | |
|  | In the event of equality in votes while casting vote on any resolution, point out how the chair of the FSSAI meeting resolve the issue. | | CO1 | An | 1 | |
|  | Point out the legislative and policy branch of WHO. | | CO1 | An | 1 | |
|  | Indicate the strain of E. Coli that produces a toxin that can cause severe illness. | | CO2 | U | 1 | |
|  | Show which part of the Protocol of Provisional Application of the General Agreement on Tariffs and Trade (PPA) talks about MFN obligation and the tariff concessions. | | CO2 | Ap | 1 | |
|  | Recall the technical specification of ISO22000 that was published explaining certification requirements applicable to third-party certification. | | CO5 | R | 1 | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Recommend where food factories should not be sited. | | CO3 | Ev | 3 | |
| 12. | Predict the common adulterants detected in milk, spices and tea. | | CO3 | U | 3 | |
| 13. | Classify Class I and Class II preservatives as per Prevention of Food Adulteration Act, 1954. | | CO3 | U | 3 | |
| 14. | Summarize how FSSA licensing and registration of food business take place in India. | | CO1 | Ev | 3 | |
| 15. | Reiterate the transparency obligations (along with the respective timelines) by which provisional measures of TBT become permanent standards. | | CO1 | An | 3 | |
| 16. | Review the core functions of National Codex Committee. | | CO1 | U | 3 | |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Write a note on the building design considerations that assure good hygienic operations with a food factory. | CO5 | Ap | | 8 | |
|  | b. | Recommend the method of detection of chicory in coffee and starch in milk. | CO2 | Ev | | 4 | |
|  |  |  |  |  | |  | |
| 18. | a. | Disintegrate the members and composition of Food Authority. | CO1 | Ap | | 6 | |
|  | b. | Enumerate the functions of Chief Executive Officer. | CO1 | R | | 6 | |
|  |  |  |  |  | |  | |
| 19. |  | A manufacturer of peanut based dark chocolate wants to develop a label for his business. Design the label for the manufacturer with special emphasis on only the consumer needs w.r.t labelling. | CO3 | U | | 12 | |
|  |  |  |  |  | |  | |
| 20. | a. | Describe the strategies of risk communication. | CO3 | U | | 6 | |
|  | b. | Identify the CPs and CCPs in the above HACCP program applied in the production of mango jam. | CO6 | U | | 6 | |
|  |  |  |  |  | |  | |
| 21. | a. | Discuss Sanitary & Phytosanitary Agreements and Technical Barriers to Trade Agreements under WTO. | CO1 | U | | 6 | |
|  | b. | Interpret the functions of WTO. | CO1 | Ap | | 6 | |
|  |  |  |  |  | |  | |
| 22. | a. | Describe the 3 tier working structure of WHO. | CO1 | U | | 6 | |
|  | b. | Summarise the FDA regulation for packaged drinking water. | CO2 | Ev | | 6 | |
|  |  |  |  |  | |  | |
| 23. | a. | Map ISO 22000 with HACCP principles. | CO5 | An | | 6 | |
|  | b. | Apply ISO22000 system in a cannery that is processing bovine fatling. | CO5 | Ap | | 6 | |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Enumerate the terms of reference of shadow committees of National Codex Committee. | CO6 | R | | 6 | |
|  | b. | Discuss the role of horizontal and vertical committees within the codex alimentarius commission. | CO6 | U | | 6 | |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the various national and international regulatory bodies working to ensure food safety in the food industries. |
| CO2 | Understand the safety aspects in food industries with special emphasis on GMO and irradiated foods, water, meat and dairy products. |
| CO3 | Apply their knowledge of regulations to develop manuals and protocols for food systems based on existing standards both national & international. |
| CO4 | Analyze and point out the various offences of Food Business Operators based on their knowledge of food regulations. |
| CO5 | Evaluate the various food hazards in a food system based on HACCP and ISO 22000:2018 standards. |
| CO6 | Create new food safety management systems or innovative norms for safety of foods. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 15 | 12 | 5 | 3 | - | 42 |
| CO2 | 1 | 2 | 1 | - | 10 | - | 14 |
| CO3 | 1 | 24 | - | - | 3 | - | 28 |
| CO4 |  | 1 |  |  |  |  | 1 |
| CO5 | 1 |  | 14 | 6 |  |  | 21 |
| CO6 | 6 | 12 |  |  |  |  | 18 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2025** | **Duration** | **3hrs** |
| **Course Name** | **ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Sketch the structure of a wheat grain having major and minor diameters and deduce an expression for the aspect ratio. | | CO1 | A | 1 |
| 2. | Construct the relationship between bulk density, true density and porosity. | | CO2 | A | 1 |
| 3. | Examine the mechanical model that depicts the pure viscous behavior. | | CO3 | R | 1 |
| 4. | Deduce an expression for apparent viscosity of non-Newtonian fluids. | | CO5 | An | 1 |
| 5. | Distinguish between thermal conductivity and diffusivity. | | CO6 | U | 1 |
| 6. | Interpret the calorific value of food. | | CO6 | U | 1 |
| 7. | Recognize the property that would make pepper to float on the water surface. | | CO4 | R | 1 |
| 8. | Recall the significance of Reynolds number. | | CO2 | R | 1 |
| 9. | Name the apparatus used for determination of spreadability of butter. | | CO3 | R | 1 |
| 10. | State the parameter that measures microwave absorptivity in foods. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Calculate the minimum and maximum radii of curvature of the barley grain if the major diameter (L) and the average of the minor and major diameters (H) measured are 8.56 and 2.75 mm, respectively. | | CO1 | A | 3 |
| 12. | Outline the classification of rheology and distinguish between pseudoplastic and dilatant fluid with examples. | | CO3 | U | 3 |
| 13. | Estimate the specific heat of potatoes containing 85% water.  Data: Cp *water*= 4186.80 J/kg K; Cp *nonfat solids*= 837.36 J/kg K. | | CO6 | E | 3 |
| 14. | Deduce an equation for drag and lift coefficient using dimensional analysis. | | CO2 | An | 3 |
| 15. | Interpret the effect of temperature on dielectric properties of food. | | CO6 | A | 3 |
| 16. | Express the phenomenon of refraction and indicate the application of refractive index in food analysis. | | CO2 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss the gas displacement method to determine volume of solid foods. | CO1 | U | 8 |
|  | b. | Explain the method of measurement of angle of repose for food materials with a neat sketch. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Interpret the generalized texture profile analysis curve and explain its properties. | CO3 | A | 8 |
|  | b. | Analyze the effect of temperature on viscosity of liquids and gases. | CO5 | An | 4 |
|  |  |  |  |  |  |
| 19. |  | Elaborate on any ONE steady and transient method of measurement of thermal conductivity. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Derive the expression for terminal velocity of a spherical particle in a fluid medium using stokes law. | CO2 | An | 8 |
|  | b. | Illustrate the reverse osmosis process with a neat sketch. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 21. | a. | Criticize the mechanism of microwave interaction with food in detail. | CO6 | E | 8 |
|  | b. | Outline any TWO methods of measuring dielectric properties in foods. | CO6 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Calculate the specific heat of wild rice grain at 20◦C with the approximate composition data given in the following table.   |  |  |  | | --- | --- | --- | | Component | Weight (%) | Specific Heat Equation | | Water | 8.5 | Cp *water* = 4176.2 − 0.0909 T + 5.4731 × 10−3T2 | | Carbohydrate | 75.3 | Cp *CHO* = 1548.8 + 1.9625 T − 5.9399 × 10−3T2 | | Protein | 14.1 | Cp *protein* = 2008.2 + 1.2089 T − 1.3129 × 10−3T2 | | Fat | 0.7 | Cp *fat* = 1984.2 + 1.4373 T − 4.8008 × 10−3T2 | | Ash | 1.4 | *Cp ash =* 1092.6 + 1.8896 T − 3.6817 × 10−3T2 | | CO6 | A | 6 |
|  | b. | Explain the working principle of capillary flow viscometer with a help of a diagram. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Recommend the various membrane separation techniques and its applications. | CO4 | E | 8 |
|  | b. | Determine the kinematic viscosity of an oil having density 981 kg/m3. The shear stress at a point in oil is 0.2452 N/m2 and velocity gradient at that point is 0.2 per second. | CO5 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Examine the principle of spectrophotometer in color measurement. | CO2 | A | 6 |
|  | b. | Colorimetric properties of potato slices during microwave frying in sunflower oil are studied in terms of a CIE scale. As a standard, a BaSO4 plate with L∗, a∗, and b∗ values of 96.9, 0.0, and 7.2, respectively was used. L∗, a∗, and b∗ values of potato slices are given in the Table. Determine E∗ values of the potato slices during frying and discuss the results.  Table. Color Values of Potato Slices During Frying | CO2 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the structure and chemical composition of foods. |
| CO2 | Understand Engineering properties of food materials. |
| CO3 | Apply the rheological physical properties of food materials to design equipments. |
| CO4 | Analyze food material for its water activity, food stability sorption and desorption isotherm. |
| CO5 | Discriminate between Newtonian and non-Newtonian fluids. |
| CO6 | Develop food equipments based on thermal, electrical and magnetic properties of food. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 8 | 4 | - | - | - | 12 |
| CO2 | 1 | 7 | 13 | 11 | - | - | 32 |
| CO3 | 2 | 9 | 8 | - | - | - | 19 |
| CO4 | 1 | - | 4 | - | 8 | - | 13 |
| CO5 | - | - | 4 | 5 | - | - | 9 |
| CO6 | 1 | 18 | 9 | - | 11 | - | 39 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP2027** | **Duration** | **3hrs** |
| **Course Name** | **FOOD PACKAGING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | What is Parkesine? | | CO1 | U | 1 |
| 2. | Mention the least and highly favourable polymers based on modulus of elasticity. | | CO1 | R | 1 |
| 3. | Define Coefficient of Friction. | | CO2 | An | 1 |
| 4. | List any one compound used to increase fluidity with aluminium. | | CO2 | A | 1 |
| 5. | Which material not preferred during metal food packaging? | | CO3 | R | 1 |
| 6. | Cite any two properties of Polymer packaging. | | CO3 | U | 1 |
| 7. | How does the tetrapak protects food material? | | CO4 | A | 1 |
| 8. | Signify the role of polyethylene in tetrapak. | | CO4 | An | 1 |
| 9. | State the uses of PFA act. | | CO5 | U | 1 |
| 10. | Expand and mention the use of ISO. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write the functions of packaging. | | CO1 | A | 3 |
| 12. | Differentiate aerosols and sanitary cans. | | CO2 | U | 3 |
| 13. | Compare the film formation by HDPE and LDPE | | CO3 | An | 3 |
| 14. | State the characteristics of rigid plastic containers. | | CO4 | A | 3 |
| 15. | Identify the function of polyethylene in tetrapak. | | CO5 | U | 3 |
| 16. | Mention any THREE materials used in aseptic packaging. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss the various tests performed on packaging materials and transmission rates. | CO1 | U | 6 |
|  | b. | Describe the concept and functions of mechanical strengths pertinent for food packaging systems. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate on the types and uses of metallic cans. Add short notes on lacquers. | CO2 | A | 6 |
|  | b. | Elucidate the design features and applications of metal cans in food package. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the formation of flexible film and their application using cellulose and Polypropylene. | CO3 | A | 6 |
|  | b. | Explain the extrusion techniques used for food packaging systems including retorts. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Elucidate the seal types used for food packaging systems with their advantages. | CO4 | E | 6 |
|  | b. | Describe the relative advantages of hot wire, hot bar and impulse sealing. | CO4 | E | 6 |
|  |  |  |  |  |  |
| 21. | a. | Summarize the innovations in the non-thermal food packaging. Add short notes on intelligent packaging. | CO5 | An | 6 |
|  | b. | Annotate the theory and practice of printing on food packages. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Discuss the details of intelligent packaging with industrial examples. | CO6 | A | 6 |
|  | b. | Appraise the theory and methods of modified atmospheric packaging. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Summarize the following with detailed overview on the Form fill seal equipment packaging methods | CO5 | A | 6 |
|  | b. | Review the thermoform sealing methods with diagrammatic representation and examples. | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Barcode and RFID sensors are of significant advancement in packaging industry. Justify with detailed principle and practice. | CO6 | An | 6 |
|  | b. | What is smart packaging? Give any two products use the technique in industry scale with relevant examples. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the need and functions of packaging in food systems. |
| CO2 | Understand about shelf life of food and various methods of estimating it. |
| CO3 | Apply their knowledge of different packaging materials, their manufacturing process and equipment involved. |
| CO4 | Analyze various closures and sealing mechanisms for use in different packaging solutions. |
| CO5 | Evaluate and select different printing and labelling methods based on legislative requirements. |
| CO6 | Devise innovations in food packaging and their applications |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 13 | 3 |  |  |  | 17 |
| CO2 |  | 3 | 13 | 1 |  |  | 17 |
| CO3 | 1 | 1 | 12 | 3 |  |  | 17 |
| CO4 |  |  | 4 | 1 | 12 |  | 17 |
| CO5 | 1 | 4 | 12 | 12 |  |  | 29 |
| CO6 |  |  | 12 | 15 |  |  | 27 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2035** | **Duration** | **3hrs** |
| **Course Name** | **STORAGE ENGINEERING OF FOOD MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define roundness. | | CO1 | R | 1 |
| 2. | Define Enthalpy. | | CO1 | R | 1 |
| 3. | Quote the energy requirement for one ton of refrigeration in terms of kcal/min. | | CO2 | U | 1 |
| 4. | Enumerate the use of expansion value in refrigeration system. | | CO2 | U | 1 |
| 5. | Suggest the heating method to overcome the improper thawing. | | CO3 | U | 1 |
| 6. | Expand LDPE packaging material. | | CO4 | R | 1 |
| 7. | Give an example for CO2 scavengers. | | CO4 | R | 1 |
| 8. | Write the advantages of CAP over MAP | | CO4 | U | 1 |
| 9. | Write the formula for Jassen equation for pressure estimation in silo  structures. | | CO6 | R | 1 |
| 10. | What will be the air flow rate through grains in silos during aeration? | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the thermal properties of food materials. | | CO1 | R | 3 |
| 12. | Discuss basic working principle of a cooling tower. | | CO2 | U | 3 |
| 13. | Write the objectives of freezing. | | CO3 | U | 3 |
| 14. | Discuss beneficial effect of modified storage system. | | CO4 | U | 3 |
| 15. | List the equipment used in control atmosphere storage. | | CO4 | R | 3 |
| 16. | Write the procedure for construction of CAP storage structure. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Briefly discuss terminal velocity and write their application in agricultural processing. | CO1 | U | 7 |
|  | b. | Determine the relative humidity, dew point temperature, humidity ratio, specific volume, and enthalpy using a psychrometric chart.  Given: Dry bulb temperature (DBT) = 35 °C, Wet bulb temperature (WBT) = 20 °C. | CO2 | An | 5 |
|  |  |  |  |  |  |
| 18. |  | Design a cold storage structure for 20 tonnes of potato having specific heat of 0.82 k cal/Kg oC is to be cooled from 35 oC to 5 oC. Thermal conductivity of construction materials such as plaster, thermocol, brick, asbestos, sand and cement concrete is 0.65 kcal/mh°C, 0.028 kcal/mh°C, 0.25 kcal/mh°C, 0.65 kcal/mhoC, 0.6 kcal/mhoC & 0.7 kcal/mhoC. Assume reasonable data where ever necessary. | CO3 | An | 12 |
| 19. | a. | Elaborate on the cryogenic freezing of food materials. | CO3 | U | 4 |
|  | b. | Explain the effects of freezing on foods. | CO3 | U | 8 |
| 20. | a. | Describe the equipment required for modified atmosphere packaging. | CO4 | A | 8 |
|  | b. | List the properties of packaging materials used modified atmosphere packaging. | CO4 | R | 4 |
| 21. | a. | Explicate the beneficial and detrimental effects of control atmospheric storage. | CO2 | U | 6 |
|  | b. | Discuss the principles and methods of CO2 scrubber in control atmosphere storage. | CO4 | U | 6 |
| 22. | a. | Explain the factors considered for degree of expansion after freezing. | CO2 | An | 6 |
|  | b. | Explain the working principle of vapour compression refrigeration system with neat sketch. | CO3 | A | 6 |
| 23. | a. | Write the procedure for construction of pusa bin. | CO5 | A | 4 |
|  | b. | Work out the economical diameter and depth of a silo to store sufficient quantity of silage for a herd of 300 dairy cows having an average body weight of 450 kg each. It has to be fed at the rate of 3 kg/100 kg of its weight. The cows fed with silage for 200 days /year. The density of silage is 650 kg/m3. | CO6 | An | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Design a bag storage structure for 250 tonnes of Paddy. The size of the bag is 100 x 60 x 30 cm and its capacity is 75 kg. Assume reasonable data where ever necessary. | CO6 | An | 8 |
|  | b. | Differentiate deep and shallow bin. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the specific storage requirements for various food materials. |
| CO2 | Understand the pre-requisites for the safe handling and storage of food materials. |
| CO3 | Solve problems related to identification of time-temperature combinations, cooling load and other operational parameters for food materials storage. |
| CO4 | Analyze the shelf-life testing of various food materials during storage. |
| CO5 | Evaluate the pest control strategies in the storage space used for food storage. |
| CO6 | Design structures for storage of grains and other major crops. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 7 | - | - | - | - | 12 |
| CO2 | - | 11 | - | 11 | - | - | 22 |
| CO3 | - | 16 | 6 | 12 | - | - | 34 |
| CO4 | 9 | 10 | 8 | - | - | - | 27 |
| CO5 | 1 | - | 4 | - | - | - | 5 |
| CO6 | 1 | 4 | 3 | 16 | - | - | 24 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP2043** | **Duration** | **3hrs** |
| **Course Name** | **NOVEL PROCESSING TECHNIQUES OF FOOD PRESERVATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Give some examples of osmotic dehydration in the food industry. | | CO1 | U | 1 |
| 2. | In PEF it can be reversible (cell membrane discharge) or irreversible (cell membrane breakdown or lysis) depending on the intensity of the field strength, but this effect can be controlled depending on the application. State the term. | | CO2 | R | 1 |
| 3. | Provide the range of applied pressures for ultrafiltration in psi/kPa. | | CO1 | R | 1 |
| 4. | Sketch the osmotic dehydration process for fruits & vegetables. | | CO3 | A | 1 |
| 5. | Define vacuum drying. | | CO1 | U | 1 |
| 6. | The basic principle of the PEF technology is the application of short pulses of high electric fields with duration of …………. to milliseconds and intensity in the order of 10-80……………... | | CO3 | A | 1 |
| 7. | State difference between osmosis and diffusion. | | CO4 | An | 1 |
| 8. | Enumerate atleast two drying technologies. | | CO2 | U | 1 |
| 9. | The HHP is characterized by three parameters. Name them. | | CO4 | E | 1 |
| 10. | State atleast two dielectric properties in food. | | CO1 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | State the Le Chatelier's principle and isostatic rule in High Hydrostatic Pressure Technology. | | CO2 | U | 3 |
| 12. | Sketch the crossflow microfiltration process. | | CO6 | C | 3 |
| 13. | State the applications of Membranes in Wastewater Treatment as 6 bullet points. | | CO3 | A | 3 |
| 14. | State two advantages and two limitations of PEF. | | CO5 | E | 3 |
| 15. | State the conventional methods of food preservation with example. | | CO3 | A | 3 |
| 16. | Recall the working principle of ultrasound processing. | | CO4 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Derive the equation for Fick’s Law of diffusion. | CO3 | A | 6 |
|  | b. | Give an example from the food industry to demonstrate the significance of membrane concentration. Explain as a case study. | CO5 | E | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain Osmotic dehydration and the factors affecting the process. Provide flowcharts wherever necessary. | CO4 | An | 8 |
|  | b. | State two major counter current flow take that place simultaneously across the semi permeable cell membrane during osmotic pre-concentration with diagram. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. |  | Describe in detail with the help of a i) diagram the ii) principle, iii) mechanism of action of pulsed electric field processing of foods and its iv) advantages and limitations. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 20. | a. | Provide Microfiltration Design Considerations. | CO6 | C | 8 |
|  | b. | State advantages and limitations of PEF. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 21. |  | Explain in detail the working i) principle, ii) mechanism of HPP with a neat diagram providing the iii) advantages and iv) applications in food industry. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 22. | a. | Comment in brief on “ultrasound” as a food preservation and processing aid. | CO4 | An | 6 |
|  | b. | Provide the application of microwave processing for foods. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Describe drying technologies in detail with illustrations wherever necessary. | CO6 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe in detail atleast 4 types of non-thermal food processing with illustrations. | CO5 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Enumerate the fundamentals of various food preservation techniques. |
| CO2 | Understand the importance of preservation techniques. |
| CO3 | Apply knowledge of choosing appropriate methods food systems. |
| CO4 | Analyze methods of various preservation techniques. |
| CO5 | Evaluate and characterize the quality of products. |
| CO6 | Design new manufacture techniques to develop process for specific purposes. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 2 |  |  |  |  | 4 |
| CO2 | 1 | 12 |  |  |  |  | 13 |
| CO3 |  |  | 20 |  |  |  | 20 |
| CO4 |  |  |  | 18 | 1 |  | 19 |
| CO5 |  |  |  |  | 45 |  | 45 |
| CO6 |  |  |  |  |  | 23 | 23 |
|  | | | | | | | **124** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP3002** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF FOOD FLAVOURANTS AND COLOURANTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | ***Thaumatin is 200 times sweeter than sucrose*** – Can you give the reasons for the same? | CO2 | An | 8 |
|  | b. | ***XXOOO is the acute testing result of a particular chemical -*** Can you explain the procedure followed in this toxicity testing. | CO1 | An | 8 |
|  |  |  |  |  |  |
| 2. | a. | ***Frying of any food leads to a desirable flavor and colour development*** – Justify with the mechanism involved. | CO4 | A | 8 |
|  | b. | Mr. Y wants to set up a ginger oleoresin manufacturing unit. Can you explain him any one of the technique involved? | CO3 | A | 8 |
|  |  |  |  |  |  |
| 3. | a. | Outline the technique of supercritical fluid extraction of oleoresins. | CO3 | A | 6 |
|  | b. | YY wants your help in the manufacture of annatto colours. Can you help him? | CO5 | A | 10 |
|  |  |  |  |  |  |
| 4. | a. | Can you explain Mr XX on the factors that affect the stability of anthocyanins? | CO4 | U | 10 |
|  | b. | Ms. BB and co. wants your help in developing beet powder. Can you help them? | CO3 | A | 6 |
|  |  |  |  |  |  |
| 5. | a. | Discuss in detail on the SAFE method of total volatile extraction | CO6 | U | 6 |
|  | b. | Can you explain Mr. UU on the technique of static head space analysis with particular reference to the types of head space injection systems used? | CO6 | U | 10 |
|  |  |  |  |  |  |
| 6. | a. | Can you briefly explain DD on the technique of SPME and its application in flavor analysis? | CO5 | U | 8 |
|  | b. | Ms. SS seeks your help in understanding the concept and working of a e-nose sensor. Can you help her? | CO6 | A | 8 |
|  |  |  |  |  |  |
| 7. |  | Can you explain M/s. *Ranlu* industries on the following techniques –  a. Microemulsified flavours  b. Extrusion of colours | CO5  CO5 | A  A | 8  8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | M/s. ***Bake fresh***, a company has appointed you to develop a sensory testing protocol for their newly developed multi grain biscuit and want you to rate their product with the other two products in the market. Can you develop a testing chart using the following methods – a. Duo –tro test b. Descriptive Testing c. Affective testing and give the final results to the company? | CO6 | An | 15 |
|  | b. | Can you outline the basic criteria to be followed while selecting the panelist for the same? | CO6 | A | 5 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the basics of flavours and colours and their safety aspects |
| CO2 | Understand the correlation between appearance and taste |
| CO3 | Develop methods for stabilization of flavourants and colourants |
| CO4 | Assess the quality of a food based on flavaourants and colourants |
| CO5 | Develop a new range of flavorants and colorants |
| CO6 | Design new techniques for analysis of colorants and aroma chemicals |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  |  | 8 |  |  | 8 |
| CO2 |  |  |  | 8 |  |  | 8 |
| CO3 |  |  | 8+6+6 |  |  |  | 20 |
| CO4 |  | 10 | 8 |  |  |  | 18 |
| CO5 |  | 8 | 10+16 |  |  |  | 34 |
| CO6 |  |  | 16+8+5 | 15 |  |  | 44 |
|  | | | | | | | **132** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP3002** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF FOOD FLAVOURANTS AND COLOURANTS** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the reason why terpenes are bitter in nature. | CO2 | An | 8 |
|  | b. | In chronic toxicity testing, briefly explain the methodology for testing of a. mutagenicity b. carcinogenicity. | CO1 | A | 2X4 = 8 |
|  |  |  |  |  |  |
| 2. | a. | Outline the changes that take place in colour and flavor development during baking of bread. | CO4 | A | 6 |
|  | b. | Outline the method for the manufacture of  a. citrus peel oil b. rose petal oil. | CO3 | A | 2X5 = 10 |
|  |  |  |  |  |  |
| 3. | a. | Outline the technique of supercritical fluid extraction of oleoresins. | CO3 | U | 6 |
|  | b. | Outline briefly the method of manufacture of  a. turmeric oleoresin b. products from saffron. | CO5 | U | 2X5 = 10 |
|  |  |  |  |  |  |
| 4. | a. | Elaborate the oxidative stability of carotenoids. | CO4 | U | 6 |
|  | b. | Explain the factors that affect the stability of anthocyanins. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Discuss in detail on the SDE method of total volatile extraction | CO6 | U | 6 |
|  | b. | Explain the technique of dynamic headspace analysis of volatiles with specific reference to the types and properties of trap materials used. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 6. | a. | Explain DD on the technique of SPME and its application in flavor analysis. | CO6 | A | 8 |
|  | b. | Elaborate the concept and working of a e-nose sensor. | CO6 | A | 8 |
|  |  |  |  |  |  |
| 7. |  | Explain M/s. *Ranlu* industries on the following techniques –  a. Plating flavours  b. Extrusion of colours | CO5 | A  A | 6  10 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | M/s. ***Juiso*** company has appointed you to develop a sensory testing protocol for their new RTS kokum juice and want you to rate their product with the other two products in the market. Develop a testing chart using the following methods – a. Duo –tro test b. Descriptive Testing c. Affective testing and give the final results to the company. | CO6 | An | 15 |
|  | b. | Outline the basic criteria to be followed while selecting the panelist for the job of a tea taster. | CO6 | A | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the basics of flavours and colours and their safety aspects. |
| CO2 | Understand the correlation between appearance and taste. |
| CO3 | Develop methods for stabilization of flavourants and colourants. |
| CO4 | Assess the quality of a food based on flavaourants and colourants. |
| CO5 | Develop a new range of flavorants and colorants. |
| CO6 | Design new techniques for analysis of colorants and aroma chemicals. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 8 |  |  |  | 8 |
| CO2 |  |  |  | 8 |  |  | 8 |
| CO3 |  | 6 | 10 |  |  |  | 16 |
| CO4 |  | 16 | 6 |  |  |  | 22 |
| CO5 |  | 10 | 16 |  |  |  | 26 |
| CO6 |  | 16 | 16+5 | 15 |  |  | 52 |
|  | | | | | | | **132** |



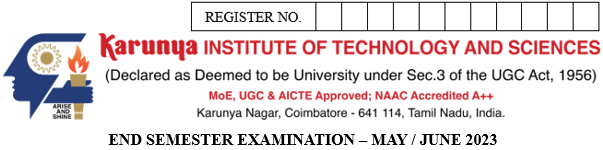
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| --- | --- | --- | --- |
| **Course Code** | **20FP3003** | **Duration** | **3hrs** |
| **Course Name** | **FOOD SAFETY REGULATIONS AND CONTROL** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Write in brief on Cleaning and Disinfection. | CO2 | U | 8 |
|  | b. | Define adulteration and contamination. Explain the terms with examples. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Draw and explain the organizational structure of FSSAI. | CO3 | R | 8 |
|  | b. | Mr. XX wants to start a new food industry, suggest him suitable procedure to obtain the registration from FSSAI. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Write a pest control policy for grain processing industry. | CO1 | U | 8 |
|  | b. | Design a hygienic plant layout for the dairy company and explain on the controlling factors in detail. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Write a short note of BRGCS and ISO 2200: 2018. | CO5 | R | 8 |
|  | b. | Describe in detail the characteristics of food hazards. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 5. | a. | Describe the intrinsic and extrinsic factors affecting the food quality. | CO1 | R | 8 |
|  | b. | Summarize the seven principles of HACCP. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Write a short note on FAO and its working. | CO3 | R | 8 |
|  | b. | Explain in details the requirements to conduct the sensory evaluation of newly developed food product. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Draw a well labeled diagram for PDCA cycle as per ISO 22000:2018. | CO5 | U | 8 |
|  | b. | Explain clause 8 as per ISO 22000:2018. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Give a detail study on all the auditable clauses of ISO 22000:2018 applicable to Dairy industry. | CO6 | C | 20 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the various national and international regulatory bodies working to ensure food safety in the food industries. |
| CO2 | Understand the safety aspects in food industries with special emphasis on GMO and irradiated foods, water, meat and dairy products. |
| CO3 | Apply their knowledge of regulations to develop manuals and protocols for food systems based on existing standards both national & international. |
| CO4 | Analyze and point out the various offences of Food Business Operators based on their knowledge of food regulations. |
| CO5 | Evaluate the various food hazards in a food system based on HACCP and ISO 22000:2018 standards. |
| CO6 | Create new food safety management systems or innovative norms for safety of foods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 8 | - | - | - | - | 16 |
| CO2 | 16 | 8 | - | - | - | - | 24 |
| CO3 | 16 | - | - | - | - | - | 16 |
| CO4 | - | 24 | - | - | - | - | 24 |
| CO5 | 8 | 24 | - | - | - | - | 32 |
| CO6 | - | - | - | - | - | 20 | 20 |
|  | | | | | | | **132** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP3004** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL TECHNIQUES FOR FOOD ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain any four chromatographic parameters to be considered to get well separated peak in chromatogram. | CO1 | An | 8 |
| b. | Illustrate the working principle of TCD and FID detectors used in Gas chromatograph with neat sketch. | CO1 | A | 8 |
|  | | | | | |
| 2. | a. | Summarize the principle and instrumentation of FT-IR spectroscopy. | CO2 | U | 8 |
| b. | Relate the absorption spectra in the fingerprint region and the functional group in FT-IR spectroscopy. | CO2 | A | 8 |
|  | | | | | |
| 3. | a. | Describe the working principle of AAS and state its limitations. | CO3 | U | 8 |
| b. | List various excitation methods used in atomic spectroscopy. | CO3 | R | 8 |
|  | | | | | |
| 4. | a. | Identify shielding and deshielding groups in NMR with suitable example. | CO4 | U | 8 |
| b. | Enumerate the properties 13C NMR with suitable example. | CO4 | R | 8 |
|  | | | | | |
| 5. | a. | Compare PAGE and agarose electrophoresis. | CO5 | E | 8 |
| b. | Differentiate native and denatured PAGE electrophoresis. | CO5 | An | 8 |
|  | | | | | |
| 6. | a. | Classify various chromatographic separations. | CO1 | U | 8 |
| b. | Demonstrate the working of HPLC with neat sketch. | CO1 | U | 8 |
|  | | | | | |
| 7. | a. | Report various molecular vibrations and their significance in identifying the functional groups in FT-IR. | CO2 | A | 8 |
| b. | Explain measurement of pH and PO2 by using potential difference. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Compare and contrast SEM, TEM for the morphological study of food materials. | CO6 | An | 10 |
| b. | Appraise the role of XRD and DSC in determining the physical properties of food materials. | CO6 | E | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the components of the mixture using chromatographic techniques. |
| CO2 | Identify the functional groups present in the food sample. |
| CO3 | Calculate the trace metals present in the food sample. |
| CO4 | Analyze the structure of the novel compound isolated from natural source. |
| CO5 | Assess the molecular weight of the given component. |
| CO6 | Organize components from mixture based on electrical property. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | --- | 16 | 8 | 8 | --- | --- | 32 |
| CO2 | --- | 8 | 16 | --- | --- | --- | 24 |
| CO3 | 8 | 8 | --- | --- | --- | --- | 16 |
| CO4 | 8 | 8 | --- | --- | --- | --- | 16 |
| CO5 | --- | 8 | --- | 8 | 8 | --- | 24 |
| CO6 | --- | --- | --- | 10 | 10 | --- | 20 |
|  | | | | | | | **132** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| --- | --- | --- | --- |
| **Course Code** | **20FP3005** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED FOOD PROCESS EQUIPMENT DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Summarise the role of mechanical properties of the material in process equipment design | CO1 | U | 16 |
|  | | | | | |
| 2. | a. | Illustrate the importance of ferrous metals and their alloys as materials of construction in process equipment design | CO2 | A | 10 |
|  | b. | |  | | --- | | State the importance of head used in pressure vessel with neat sketch | | CO2 | R | 6 |
|  | | | | | |
| 3. | a. | Show the expression for heat transfer rate through two composite walls connected in series with thermal conductivity k1, k2 and thickness x1 and x2. | CO2 | A | 8 |
| b. | A wall of 0.5 m thickness is constructed using a material having a thermal conductivity of 1.4 W/ (m·K). The wall is insulated with a material having a thermal conductivity of 0.35 W/ (m·K) so that heat loss per m2 is 1500 W. The inner and outer temperatures are 1273 K (1000°C) and 373 K (100°C) respectively. Calculate the thickness of insulation required and the temperature of the interface between two layers. | CO3 | E | 8 |
|  | | | | | |
| 4. | a. | Classify reactors on the mode of operation and get the design equation for FPR. | CO3 | U | 8 |
| b. | We are planning to operate a mixed flow reactor to convert A into R. This is a liquid phase reaction, with the stoichiometry A gives R. The rate of reaction as a function of concentration is given below. What size of mixed flow reactor is required to achieve 75% conversion of a feed stream of 1000 mol A/h with CAo = 1.2 mol/l ? | CO5 | An | 8 |
|  | | | | | |
| 5. | a. | Discuss in detail the importance of overall heat transfer coefficient and derive the expression for the same. | CO2 | U | 8 |
| b. | State the classification of heat exchangers and give example for each. | CO4 | R | 8 |
|  | | | | | |
| 6. | a. | Calculate the heat transfer coefficient for fluid flowing through a tube having inside diameter40 mm at a rate of 5500 kg/hr. Assume that the fluid is being heated. Properties of the fluid at mean bulk temperature are i. viscosity of flowing fluid 0.004 N.s/m2, density of flowing fluid 1.07 g/cm3, specific heat of flowing fluid 2.72 kJ/kgK, thermal conductivity of flowing fluid 0.256 W/m K. | CO1 | An | 6 |
| b. | Explain with neat sketch the working of Shell and Tube heat exchanger. | CO1 | U | 10 |
|  | | | | | |
| 7. | a. | In an experiment to measure the thermal conductivity of meat, beef was formed into a square section block 5 cm × 5 cm and 1 cm thick. The edges of the block were insulated and heat was supplied continuously to one face of the block at a rate of 0.80 W. The temperatures of each face were measured with thermocouples and found to be 28.5 and 23.3°C, respectively. What is the thermal conductivity of beef? | CO3 | E | 10 |
| b. | Summarise LMTD and the correction factor for LMTD | CO4 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Discuss in detail the factors that will affect drying operation. | CO6 | An | 10 |
| b. | Derive the expression for total drying time for batch drying operations. | CO6 | E | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the factors that affects the design of equipments |
| CO2 | Classify the design variables based on various properties |
| CO3 | Relate various process variables |
| CO4 | Prioritize the critical variables for the design of equipments |
| CO5 | Recommend a conceptual design model |
| CO6 | Assess the validity of the conceptual model |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 16 | --- | 6 | --- | --- | 32 |
| CO2 | 6 | 8 | 18 | --- | --- | --- | 32 |
| CO3 | --- | 8 | --- | --- | 18 | --- | 26 |
| CO4 | 8 | 6 | --- | --- | --- | --- | 14 |
| CO5 | --- | --- | --- | 8 | --- | --- | 08 |
| CO6 | --- | --- | --- | 10 | 10 | --- | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **20FP3005** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED FOOD PROCESS EQUIPMENT DESIGN** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | | | | | | | **CO** | | **BL** | | | **Marks** | |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | | | | | | | | | | | | |
| 1. | a | | Summarize the role of mechanical properties of the material in process equipment design. | | | | | | | | CO1 | | U | | | 8 |
| b | | Discuss in detail the basic considerations in process equipment design. | | | | | | | | CO1 | | R | | | 8 |
| 2. | a | | Demonstrate the importance of different types of nozzle in used in Pressure vessels. | | | | | | | | CO2 | | A | | | 10 |
| b | | |  | | --- | | State the importance of head used in pressure vessel with neat sketch. | | | | | | | | | CO2 | | R | | | 6 |
| 3. | a | | A wall of 0.5 m thickness is constructed using a material having a thermal conductivity of 1.4 W/ (m·K). The wall is insulated with a material having a thermal conductivity of 0.35 W/ (m·K) so that heat loss per m2 is 1500 W. The inner and outer temperatures are 1273 K (1000°C) and 373 K (100°C) respectively. Calculate the thickness of insulation required and the temperature of the interface between two layers. | | | | | | | | CO3 | | E | | | 8 |
| b | | Explain the cooling load calculation in cold storage unit. | | | | | | | | CO3 | | An | | | 8 |
| 4. | a | | Cold fluid is flowing through the heat exchanger at a rate of 15 m3/hr. It enters the heat exchanger at 303 K and leaves at 328 K. A hot thermic fluid enters the heat exchanger at a rate of 21 m3/hr. at a temperature of 388 K. Find the area of heat transfer required assuming the flow to be counter current and overall heat transfer coefficient to be 3490 W/m2K. Density of the cold fluid 1000 kg/m3. Density of the thermic fluid 950 kg/m3. Specific heat of cold fluid is 4.187 kJ/kg K and that of thermic fluid is 2.93 kJ/kg K. | | | | | | | | CO6 | | C | | | 10 |
| b | | State the classification of heat exchangers and give example for each. | | | | | | | | CO4 | | R | | | 6 |
| 5. | a | | Obtain the design equation for CSTR and PFR. | | | | | | | | CO5 | | An | | | 8 |
| b | | We are planning to operate a mixed flow reactor to convert A into R. This is a liquid phase reaction, with the stoichiometry A gives R. The rate of reaction as a function of concentration is given below. What size of mixed flow reactor is required to achieve 75% conversion of a feed stream of 1000 mol A/h with CAo = 1.2 mol/l ? | | | | | | | | CO5 | | E | | | 8 |
| 6. | a | | Calculate the heat transfer coefficient for fluid flowing through a tube having inside diameter40 mm at a rate of 5500 kg/hr. Assume that the fluid is being heated. Properties of the fluid at mean bulk temperature are i. viscosity of flowing fluid 0.004 N.s/m2, density of flowing fluid 1.07 g/cm3, specific heat of flowing fluid 2.72 kJ/kgK, thermal conductivity of flowing fluid 0.256 W/m K. | | | | | | | | CO6 | | E | | | 8 |
| b | | Explain with neat sketch the working of double pipe heat exchanger | | | | | | | | CO5 | | U | | | 8 |
| 7. | a | | The laboratory measurements of rate v/s conversion for reactant A are given below. Compare the volumes of a mixed flow reactor (CSTR) and a plug flow reactor required to achieve 60% conversion. The feed conditions are the same in both the cases and molar flow rate of A entering the reaction is 10 mol/s.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | XA, | 0 | 0.20 | 0.40 | 0.60 | 0.80 | | -rA, (mol/l.min) | 0.182 | 0.143 | 0.10 | 0.0667 | 0.0357 | | | | | | | | | CO4 | | A | | | 10 |
| b | | Discuss in detail the classifications of heat exchangers | | | | | | | | CO4 | | U | | | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | | | | | | | | | | | |
| 8. |  | | A batch of solids is to be dried from 28% to 6% moisture, on wet basis. The initial weight of the solid is 380 kg and the drying surface is 0.15m2/40 kg of dry weight. The critical moisture content is 18% dry basis and the constant drying rate is 0.32 kg/m2h. For the falling rate period, the following data are available.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Moisture content, % dry basis | 25 | 21.9 | 19 | 16 | 13.6 | 11 | 8.2 | 7.5 | 6.4 | | Rate of drying kg/m2.h | 0.3 | 0.27 | 0.24 | 0.21 | 0.18 | 0.15 | 0.07 | 0.044 | 0.025 | | | | | | | | | CO6 | | E | | | 20 |
| **CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL | | | | | | | | | | | | | | | | |
|  | | **COURSE OUTCOMES** | | | | | | | | | | | | | | |
| CO1 | | Identify the factors that affects the design of equipments. | | | | | | | | | | | | | | |
| CO2 | | Classify the design variables based on various properties. | | | | | | | | | | | | | | |
| CO3 | | Relate various process variables. | | | | | | | | | | | | | | |
| CO4 | | Prioritize the critical variables for the design of equipments. | | | | | | | | | | | | | | |
| CO5 | | Recommend a conceptual design model. | | | | | | | | | | | | | | |
| CO6 | | Assess the validity of the conceptual model. | | | | | | | | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | | | | | | | | | |
| CO / P | | | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | | | | | **Total** | | |
| CO1 | | | | 8 | 8 |  |  |  |  | | | | | 16 | | |
| CO2 | | | | 6 |  | 10 |  |  |  | | | | | 16 | | |
| CO3 | | | |  |  |  | 8 | 8 |  | | | | | 16 | | |
| CO4 | | | | 6 | 6 | 10 |  |  |  | | | | | 22 | | |
| CO5 | | | |  | 8 |  | 8 | 8 |  | | | | | 24 | | |
| CO6 | | | |  |  |  |  | 28 | 10 | | | | | 38 | | |
|  | | | | | | | | | | | | | | **132** | | |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Subject Code** | **20FP3006** | **Duration** | **3hrs** |
| **Subject Name** | **ADVANCES IN FOOD PROCESS ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Summarize the principles and methods of Pasteurization process. | CO1 | E | 8 |
|  | b. | Explain the general method for thermal process time calculation. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. | a. | Analyze the effect of freezing on food products. | CO2 | An | 8 |
|  | b. | Demonstrate freeze concentration process with a neat sketch and list its merits and limitations. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Interpret the principle, working and design aspects of Spray dryer with a diagram. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. | a. | Show the mechanism for the delivery of bioactive lipids, and proteins. | CO4 | U | 10 |
|  | b. | Recall the advantage of nano size food additives. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 5. | a. | Appraise the methods used for encapsulation of functional foods. | CO5 | E | 10 |
|  | b. | Identify the material used for encapsulated product. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 6. | a. | Examine the release pattern of encapsulated materials. | CO3 | A | 10 |
|  | b. | Compare and contrast nano and micro encapsulation. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 7. | a. | Interpret the working principle of microwave drying. | CO4 | A | 8 |
|  | b. | Sketch a neat diagram of infrared dryer and explain its working principle. | CO5 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Identify the role of bio-catalyst in food processing industries and explain its types. | CO6 | R | 10 |
|  | b. | Critically analyze the working principle of e- nose. | CO6 | E | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the role of time – temperature combination of food processing. |
| CO2 | Explain the low temperature food preservation. |
| CO3 | Identify the suitable drying methods for specific food. |
| CO4 | Describe the technology that useful for targeted food delivery. |
| CO5 | Analyze the importance of food nano structures |
| CO6 | Evaluate the efficiency of biosensors in food applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 8 |  | 8 |  | 16 |
| CO2 |  | 8 |  | 8 |  |  | 16 |
| CO3 |  |  | 26 |  |  |  | 26 |
| CO4 | 6 | 10 | 8 |  |  |  | 24 |
| CO5 | 6 |  |  | 6 | 18 |  | 30 |
| CO6 | 10 |  |  |  | 10 |  | 20 |
|  | | | | | | | **132** |



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| **Course Code:** | **20FP3006** | **Duration** | **3hrs** |
| **Course Name:** | **ADVANCES IN FOOD PROCESS ENGINEERING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | A sterilization process is being designed to achieve an Fo of 8 mins. The parameters of time for heat penetration data are given below. Find out fh and jh. Initial product temperature is 75°F and process temperature is 240°F. Calculate the process time using Ball's formula. (RT - Retort temperature & PT - Product temperature.). Assume the necessary values.   |  |  |  | | --- | --- | --- | | **Time (mins)** | **Temperature (TR°F)** | **Food Temperature (TO°F)** | | 0 | 71 | 70 | | 5 | 152 | 75 | | 10 | 240 | 94 | | 15 | 240 | 154 | | 20 | 240 | 194 | | 25 | 240 | 215 | | 30 | 240 | 229 | | 35 | 240 | 234 | | 40 | 240 | 237 | | 45 | 158 | 197 | | 50 | 70 | 145 | | 55 | 68 | 118 | | 60 | 68 | 100 | | CO1 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Discuss the theory of freeze drying with the changes occurring during freezing. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Illustrate the principle, construction and working of spray drying in detail with neat sketch. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss the technology for creating structured delivery system. | CO4 | C | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the materials used to make encapsulated products. | CO4 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Food with an initial moisture content of 400% (dry-weight basis) is poured into 0.5 cm layers in a tray placed in a freeze drier operating at 40 Pa. It is to be dried to 8% moisture (dry-weight basis) at a maximum surface temperature of 55°C. Assuming that the pressure at the ice front remains constant at 78 Pa, calculate (a) the drying time and (b) the drying time if the layer of food is increased to 0.9 cm and dried under similar conditions. (Additional data: the dried food has a thermal conductivity of 0.03 W m-1K-¹, a density of 470 kg m -3. a permeability of 2.4 x 10-8 kg s-1 and the latent heat of sublimation is 2.95 x 10 3 kJ kg -1). | CO2 | E | 10 |
|  | b. | Explain the different types of freeze dryers. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Indicate the various nano sized food ingredients used in food industries and mention their merits and limitations. | CO5 | A | 10 |
|  | b. | Discuss how additives play a role in preparing nano-based foods. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the principle of encapsulation of food products in detail. | CO4 | R | 10 |
|  | b. | Demonstrate the methods of encapsulation of food products. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the methods of developing various types of biosensors. | CO6 | An | 10 |
|  | b. | Appraise the role and applications of biosensors in food industries. | CO6 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the role of time – temperature combination of food processing. |
| CO2 | Explain the low temperature food preservation. |
| CO3 | Identify the suitable drying methods for specific food. |
| CO4 | Describe the technology that useful for targeted food delivery. |
| CO5 | Analyze the importance of food nanostructures. |
| CO6 | Evaluate the efficiency of biosensors in food applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 0 | 0 | 0 | 0 | 20 | 0 | 20 |
| CO2 | 0 | 20 | 0 | 10 | 10 | 0 | 40 |
| CO3 | 0 | 0 | 20 | 0 | 0 | 0 | 20 |
| CO4 | 30 | 10 | 0 | 0 | 0 | 20 | 60 |
| CO5 | 0 | 10 | 10 | 0 | 0 | 0 | 20 |
| CO6 | 0 | 0 | 0 | 20 | 0 | 0 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FP3012** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN PROCESSING OF CEREALS, PULSES AND OIL SEEDS** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Classify the various methods of grain drying with a neat labeled sketch. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the wheat milling process with a flow chart. | CO2 | A | 10 |
|  | b. | Describe the various products and by products of wheat milling. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. |  | Discuss the extraction methods and refining of corn oil in detail. | CO4 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Describe the domestic and commercial scale of pulse milling methods. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Explain the solvent extraction method along with their flow chart. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Demonstrate the process of oil extraction from soybean, sunflower, and coconut kernel. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | Analyze the corn tempering degerming process. | CO4 | An | 10 |
|  | b. | Interpret the corn wet milling process. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Summarize the different types of rice whitening processes along with their merits and demerits. | CO2 | E | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Prioritize the need for post-harvest processing and explain the value addition of finger millet and pearl millet. | CO6 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge on the structure, composition and pre-milling operations of food grains, pulses and oil seeds. |
| CO2 | Understand the paddy processing and rice milling equipment which will help them for developing entrepreneurial skills. |
| CO3 | Develop skills needed in milling of pulses and oil seeds which will promote employment. |
| CO4 | Analyze the suitable method for corn/maize milling. |
| CO5 | Predict a better equipment for processing the raw materials. |
| CO6 | Apply the knowledge to process food grains into value added products. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 0 | 20 | 0 | 0 | 0 | 0 | 20 |
| CO2 | 10 | 0 | 10 | 0 | 20 | 0 | 40 |
| CO3 | 0 | 20 | 20 | 0 | 0 | 0 | 40 |
| CO4 | 0 | 0 | 0 | 20 | 0 | 20 | 40 |
| CO5 | 0 | 0 | 20 | 0 | 0 | 0 | 20 |
| CO6 | 0 | 0 | 0 | 0 | 20 | 0 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FP3012** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN PROCESSING OF CEREALS, PULSES AND OIL SEEDS** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Briefly explain CFTRI method of paddy parboiling and also write the advantages and disadvantages of parboiling. | CO1 | U | 8 |
|  | b. | Discuss the changes in the milling quality, nutritional quality and cooking quality of rice after parboiling. | CO2 | E | 8 |
| 2. |  | Explain the different methods of bulgur production. | CO6 | E | 16 |
| 3. | a. | Identify the steps involved in dry milling of corn with a flow diagram. | CO4 | A | 8 |
|  | b. | Construct the flowchart for traditional method of tortilla production. | CO6 | A | 8 |
| 4. | a. | Explain the CIAE method of pulse milling and List the factors affecting pulse milling outturn. | CO3 | E | 8 |
|  | b. | In pigeon pea milling experiment with concentric cylinder abrasive will the following observations were made   1. Amount of unhulled grains = 2.5% 2. Recovery of whole split kernels after milling = 71.4% 3. Amount of crushed kernels = 3.6% 4. Amount of powder generated = 11% 5. Amount of husk removed = 11.5%   The cotyledon to grain ratio of the grains was 86.5. Calculate the milling efficiency of the system. | CO3 | E | 8 |
| 5. |  | Explain screw press oil extraction method with neat sketch. | CO5 | A | 16 |
| 6. | a. | Demonstrate the construction and working of LSU dryer with a neat sketch. | CO5 | U | 8 |
|  | b. | Explain the manufacturing process of puffed rice. | CO2 | A | 8 |
| 7. | a. | Outline the HFCS production process. | CO4 | U | 8 |
|  | b. | Interpret the Super Critical Fluid Extraction of corn oil. | CO3 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Discuss the pearl millet processing and the value-added products manufactured using the pearl millet. | CO5 | A | 10 |
|  | b. | List the unit operations and machines and/or equipment used for finger millet processing and also list the products that are made from finger millet. | CO1 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge on the structure, composition and pre milling operations of food grains, pulses and oil seeds. |
| CO2 | Understand the Paddy Processing and Rice milling equipment which will help them for developing entrepreneurial skills. |
| CO3 | Develop skills needed in milling of pulses and oil seeds which will promote employment. |
| CO4 | Analyze the suitable method for corn/maize milling. |
| CO5 | Predict a better equipment for processing the raw materials. |
| CO6 | Apply the knowledge to process food grains into value added products. |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 8 | - | 10 | - | - | 18 |
| CO2 | - | - | 8 | - | 8 | - | 16 |
| CO3 | - | - | - | - | 24 | - | 24 |
| CO4 | - | 8 | 8 | - | - | - | 16 |
| CO5 | - | 8 | 16 | - | - | - | 34 |
| CO6 | - | - | 8 | - | 16 | - | 24 |
|  | | | | | | | **132** |



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| --- | --- | --- | --- |
| **Course Code** | **20FP3013** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN PROCESSING OF HORTICULTURE, SPICES AND PLANTATION PRODUCTS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the commercial canning process for fruits and vegetables. | CO1 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the requirement of intermediate moisture foods. | CO2 | U | 10 |
|  | b. | Interpret the various methods of sensory evaluation of fruits and vegetables. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Describe the chemistry of tea processing. | CO1 | R | 12 |
|  | b. | Indicate the various quality characteristics of tea. | CO3 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Detail the processing of coffee cherries by wet and dry method with a flow chart. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Summarize the various unit operations involved in the processing of cocoa bean. | CO1 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Elaborate the different methods adopted for the preservation of fruits and vegetables. | CO3 | C | 20 |
|  |  |  |  |  |  |
| 7. | a. | Demonstrate the instant coffee preparation process. | CO1 | U | 10 |
|  | b. | Point out the uses of chicory in coffee preparation. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define ossmosis and explain the significance of osmatic dehydration as a preservation method. | CO4 | R | 10 |
|  | b. | Prioritize the need for foam mat drying and explain the parameters to be considered before foam mat drying. | CO3 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Compose the different methods of essential oil extraction. | CO5 | C | 20 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Define the different unit operations and its equipment’s involved in coffee, tea and cocoa processing. |
| CO2 | Gain knowledge in processing of plantation crops and spices and also its value-added products. |
| CO3 | Outline ways in which quality loss can be minimized during preparation and processing. |
| CO4 | Develop value added products from plantation products and spices. |
| CO5 | Demonstrate appropriate technique for the extraction of spice oil and oleoresin with quality standards. |
| CO6 | Acquire a confident to get placement in any kind of cereals and spices industry with minimum post-harvest losses and maximum benefit to the industry. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 12 | 20 | 20 | 0 | 20 | 0 | 72 |
| CO2 | 0 | 10 | 10 | 20 | 0 | 0 | 40 |
| CO3 | 0 | 8 | 0 | 10 | 0 | 20 | 38 |
| CO4 | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| CO5 | 0 | 0 | 0 | 0 | 0 | 20 | 20 |
| CO6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | | | | | | | **180** |



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| **Course Code** | **20FP3016** | **Duration** | **3hrs** |
| **Course Name** | **MILLING, BAKERY AND CONFECTIONERY TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Examine the role of viscograph, amylograph, and farinograph in dough making. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Demonstrate the various unit operations involved in bread manufacturing process with its flow chart. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss the process of snack food preparations and dedicated equipments. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Compile the different steps involved in wine manufacturing process. | CO5 | C | 20 |
|  |  |  |  |  |  |
| 5. |  | Elaborate the manufacturing process and raw ingredients used in carbonated beverages. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Illustrate the cake flour specification, ingredients used and cake manufacturing process. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Critically analyze the snack food prepared from animal origin. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the various types of dough mixers in detail. | CO1 | R | 10 |
|  | b. | Demonstrate the construction and working of oven equipment used for baking. | CO1 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Appraise the raw materials and processing of chocolate with its flow chart. | CO6 | E | 20 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge on the ingredients, process and machinery involved in bakery and confectionery and beverage technology. |
| CO2 | Understand the importance and effect of quality of raw materials on the final products. |
| CO3 | Apply the knowledge gained in formulating new types of products. |
| CO4 | Analyze the process for maintaining and improving the quality of the final product. |
| CO5 | Evaluate the steps involved in the process and improve existing technologies or develop newer technologies. |
| CO6 | Design and create newer process and products that are better economically, nutritionally or technologically. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 50 | 0 | 0 | 0 | 0 | 60 |
| CO2 | 0 | 20 | 20 | 0 | 0 | 0 | 40 |
| CO3 | 0 | 0 | 20 | 0 | 0 | 0 | 20 |
| CO4 | 0 | 0 | 0 | 20 | 0 | 0 | 20 |
| CO5 | 0 | 0 | 0 | 0 | 0 | 20 | 20 |
| CO6 | 0 | 0 | 0 | 0 | 20 | 0 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FP3018** | **Duration** | **3hrs** |
| **Course Name** | **EMERGING TRENDS IN FOOD PROCESS ENGINEERING.** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Illustrate the different hurdles with a neat diagram. | CO1 | U | 8 |
|  | b. | Interpret the applications of hurdle technology in food processing. | CO1 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Discuss the principle of Pulsed Light, microbial inactivation mechanism and its effect on microorganism. | CO2 | An | 10 |
|  | b. | Distinguish between Ionizing and Non – Ionizing radiation. | CO2 | A | 2 |
|  | c. | List the applications of UV light in food industries. | CO2 | R | 4 |
|  |  |  |  |  |  |
| 3. | a. | Explain the ohmic heating process and its inactivation mechanism with a neat sketch. | CO3 | A | 8 |
|  | b. | Report the recent advancement in microwave processing of foods. | CO3 | C | 8 |
|  |  |  |  |  |  |
| 4. | a. | State the principles of HPP and demonstrate the construction and working of HPP unit with a neat sketch. | CO4 | A | 10 |
|  | b. | Interpret on cavitation effect of ultrasound and list the applications of ultrasound in food industry. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Express the effect of irradiation on food constituents, microorganisms and enzymes. | CO6 | E | 6 |
|  | b. | Classify the irradiation treatment based on the level of irradiation. | CO3 | U | 4 |
|  | c. | Illustrate the applications of irradiation in Food industries. | CO6 | An | 6 |
|  |  |  |  |  |  |
| 6. | a. | Write a detailed note on instrumentation, mechanism of inactivation and applications of PEF technology in ensuring safety of food products. | CO3 | A | 12 |
|  | b. | Show how the mercury vapor lamps are different from xenon lamps in generating different light sources. | CO2 | E | 4 |
|  |  |  |  |  |  |
| 7. | a. | Review the following processes: i) Thermosonication ii) Manosonication and iii. Thermomanosonication. | CO4 | U | 6 |
|  | b. | Compare and contrast X -rays and Gamma rays used in irradiation treatments. | CO6 | E | 4 |
|  | c. | Recommend the range of products treated using ohmic heating process. | CO6 | E | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Propose the different methods cold plasma generation with a diagram. | CO5 | C | 10 |
|  | b. | Summarize the applications of cold plasma in food processing. | CO5 | E | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Remember the principles of preservation. |
| CO2 | Interpret the various emerging techniques available for food processing. |
| CO3 | Apply the techniques for preservation of foods. |
| CO4 | Analyze the most suitable method for processing foods. |
| CO5 | Explain a novel food preservation technique. |
| CO6 | Evaluate the suitability of the techniques for specific foods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 8 | - | - | - | - | 16 |
| CO2 | 4 | - | 2 | 10 | 4 | - | 20 |
| CO3 | - | 4 | 2 | - | - | 8 | 32 |
| CO4 | - | 12 | 10 | - | - | - | 22 |
| CO5 | - | - | - | - | 10 | 10 | 20 |
| CO6 | - | - | - | 6 | 16 | - | 22 |
|  | | | | | | | **132** |



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| **Course Code** | **20FT3007** | **Duration :** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF MILK AND MILK PRODUCTS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | | **CO/BL** | **Marks** | |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss in detail the constituents of milk and its physico-chemical properties. | CO1/U | | 15 |
|  | b. | Examine the various adulterants in milk, its causes and preventions. | CO5/A | | 5 |
| **(OR)** | | | | | |
| 2. | a. | Illustrate in detail the steps involved in the manufacture of pasteurized milk using HTST method. | CO4/An | | 15 |
|  | b. | Interpret instantization and agglomeration. | CO2/A | | 5 |
|  |  |  |  | |  |
| 3. | a. | Illustrate the manufacturing of cream and describe its properties. | CO4/A | | 15 |
|  | b. | Outline the various classification of butter and define the overrun. | CO6/U | | 5 |
| **(OR)** | | | | | |
| 4. |  | Interpret the different methods of ghee manufacturing with a flow chart. | CO2/An | | 20 |
|  |  |  |  | |  |
| 5. | a. | Outline the process involved in the spray drying of milk. | CO2/U | | 15 |
|  | b. | Demonstrate the drying process of milk in a drum dryer. | CO4/An | | 5 |
| **(OR)** | | | | | |
| 6. | a. | Demonstrate the principle and working of a homogenizer and explain the method of manufacture of homogenized milk. | CO4/A | | 15 |
|  | b. | Examine the method of manufacture of evaporated milk. | CO3/An | | 5 |
|  |  |  |  | |  |
| 7. | a. | Construct the manufacturing steps involved in the processing of butter and explain. | CO3/C | | 10 |
|  | b. | Recommend the manufacturing method of cheddar cheese with a flowchart. | CO3/E | | 10 |
| **(OR)** | | | | | |
| 8. | a. | Briefly explain the steps involved in the manufacture of ice cream. | CO2/A | | 15 |
|  | b. | Summarize the properties of ice cream mix. | CO1/E | | 5 |
|  | | **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** |  | |  |
| 9. |  | Elaborate on the method of manufacture of any five fermented milk products. | CO6/C | | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on properties and composition of milk. |
| CO2 | To understand the processing techniques of milk. |
| CO3 | To learn the different milk products manufacturing. |
| CO4 | To understand the equipment used in dairy products manufacturing. |
| CO5 | To learn the packaging and storage of various milk products. |
| CO6 | To acquire knowledge on the Indian dairy products and their manufacturing. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 15 |  |  | 5 |  | 20 |
| CO2 |  | 15 | 20 | 20 |  |  | 55 |
| CO3 |  |  |  | 5 | 10 | 10 | 25 |
| CO4 |  |  | 30 | 20 |  |  | 50 |
| CO5 |  |  | 5 |  |  |  | 5 |
| CO6 |  | 5 |  |  |  | 20 | 25 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

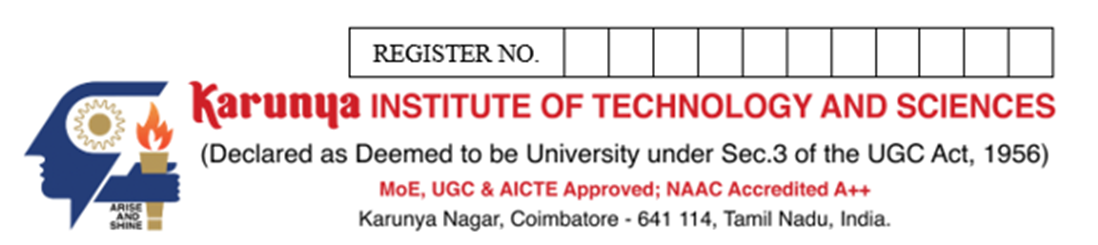
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| **Course Code** | **20FT3014** | **Duration** | **3hrs** |
| **Course Name** | **FOOD TOXICOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Mr. XX wants your recommendations and ideas on the Up- and -Down method of determining toxicity. Can you help him. | CO5 | An | 10 |
|  | b. | Briefly outline the methods for testing - a. Teratogenicity b. Carcinogenicity. | CO6 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | ***Gut is the second brain and a proper gut health is necessary for a proper well being*** – Justify the statement. | CO3 | An | 10 |
|  | b. | It is said that water soluble compounds don’t reach the brain due to certain reasons – Can you discuss the reasons for the same. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss briefly on the Phase II reactions and the factors affecting the same. | CO3 | A | 10 |
|  | b. | Ms. Mumu wants to know on the role of Phase II enzymes in the body. Can you help her. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Mr.Yuyu needs clarity on the biotransformation reactions particularly the Phase I reactions. Can you explain in detail on the Phase I reactions. | CO3 | A | 10 |
|  | b. | ***Cytochrome P450 group of enzymes play a major role in xenobiotic biotransformations*** – Justify. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | ***People can get a version of BSE called variant Creutzfeldt-Jakob disease (vCJD) –*** Justify the statement and discuss in detail on the same. | CO6 | A | 10 |
|  | b. | Briefly discuss on the following – a. Tetrodotoxin b. Ciguatera Toxin. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss briefly on the following – a. Protease inhibitors b. Cyanogens. | CO1 | A | 10 |
|  | b. | M/s. Peanut exports are of the opinion that their consignment might be contaminated. They want your guidance on a. Fuminosin b. Ochratoxin. Can you guide them? | CO4 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Mr. XX wants to have an idea of the following toxins. Can you give him a brief about the same.   1. a. Vasoactive amines 2. b. Ciguatera Poisoning | CO1 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Mr. A wants to get an idea of the following antinutritional factors. Can you give your inputs on their source, activity, mode of action and methods of destruction.  (i) Trypsin inhibitors  (ii) Lathyrogens | CO1 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss briefly on the following –  (i) Lead poisoning.  (ii) Pesticide residues and health effects. | CO2 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | acquire knowledge on the types on toxicants in foods. |
| CO2 | identify toxins in food products. |
| CO3 | summarize the effect of toxicants on the human system. |
| CO4 | examine the methods of destruction of toxicants. |
| CO5 | develop methods for detection of toxicants. |
| CO6 | evaluate the safety of food commodities. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | 60 | - | - | - | 60 |
| CO2 | - | - | 20 | - | - | - | 20 |
| CO3 | - | - | 30 | 10 | - | - | 40 |
| CO4 | - | - | 30 | - | - | - | 30 |
| CO5 | - | - | - | 10 | - | - | 10 |
| CO6 | - | - | 10 | 10 | - | - | 20 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

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| **Course Code** | **20FT3016** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL METHODS OF ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the electromagnetic spectrum with the help of a diagram and explain in brief the Beer Lambert’s Law. | CO3 | An | 10 |
|  | b. | Explain in detail the working of the ICP-AES instrumentation. | CO4 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Elucidate the classification of chromatography based on phases, mechanism of separation, shape of chromatographic bed and also provide a flowchart for the classification. | CO2 | U | 10 |
|  | b. | Elucidate the details of an HPLC instrumentation along with the illustration (diagram). | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the working of an IR spectrophotometer and write a note on the radiation source and detectors as its two main components. Describe three IR region and explain the modes of vibration. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Demonstrate the instrumentation of the UV-Visible spectrophotometer providing explanation to each component of the instrumentation. | CO2 | U | 10 |
|  | b. | Write the theory of and working principle of electrophoresis and the factors affecting it. | CO6 | C | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the Larmor Frequency and NMR Signal Detection supported by diagrams. | CO5 | An | 10 |
|  | b. | Explain the principle of chromatography and its application and define each of the following terms  - mobile phase  -stationary phase  -chromatogram  -analyte  -eluent | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail Nuclear magnetic moment and spin states. | CO5 | E | 10 |
|  | b. | Explain and illustrate with the help of a diagram the 1H NMR Spectrum, Shielding and Chemical Shift. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe a Michelson Interferometer with a diagram and explain the term “interference” in detail. | CO1 | R | 10 |
|  | b. | Explain in detail ANY TWO types of chromatography techniques. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Demonstrate the measurement principle of the mass spectrometry with the help of a schematic. | CO4 | An | 10 |
|  | b. | Describe gas ionization in mass spectrometry. | CO6 | A | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a note on SEM, its working principle and its application in detail with the help of a diagram. | CO5 | E | 20 |

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | recognize the components of the mixture using chromatographic techniques. |
| CO2 | identify the functional groups present in the food sample |
| CO3 | calculate the trace metals present in the food sample |
| CO4 | analyze the structure of the novel compound isolated from natural source |
| CO5 | assess the molecular weight of the given component |
| CO6 | organize components from mixture based on electrical property |

|  |  |  |  |  |  |  |  |
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 |  |  |  |  |  | 10 |
| CO2 |  | 30 | 10 |  |  |  | 40 |
| CO3 |  |  |  | 10 |  |  | 10 |
| CO4 |  |  | 10 | 30 | 10 |  | 50 |
| CO5 |  |  |  | 20 | 30 |  | 50 |
| CO6 |  |  | 10 |  |  | 10 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FT3017** | **Duration** | **3hrs** |
| **Course Name** | **FOOD ADDITIVES AND INGREDIENTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Write the classification of food additives. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the role of sweeteners in food industry with an example. | CO2 | A | 12 |
|  | b. | Explain the safety and testing aspects of food additives. | CO2 | An | 8 |
|  |  |  |  |  |  |
| 3. |  | Briefly explain about flavoring agents and their classification. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Describe the role of antioxidants & sequestrants in food. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the function of acidulants in the food industry. | CO5 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the mode of action of antimicrobial preservatives. | CO3 | E | 12 |
|  | b. | Categorize cheating agents used in food. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 7. |  | Describe the use of colorants in various food categories. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Enumerate the advantage of using emulsifiers and stabilizers in food industry. | CO6 | An | 12 |
|  | b. | Write the detailed note on use of pigments in food industry. | CO3 | U | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain role of bleaching & maturing agents, Anti-caking agents and Humectants used in food industry with examples. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of additives in maintaining or improving food quality. |
| CO2 | Demonstrate and relate the level of addition of food additives to its quality. |
| CO3 | Understand the applications of food additives and methods to study their permissible limits. |
| CO4 | Categorize and choose the appropriate additive depending on the type of food. |
| CO5 | Identify and design newer products, with better quality using additives which are economical and safe. |
| CO6 | Develop a new range of additives which are multifunctional and safe. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | - | - | 12 | 8 | - | - | 20 |
| CO3 | - | 36 | - | - | 12 | - | 48 |
| CO4 | - | - | 20 | 20 | - | - | 40 |
| CO5 | - | - | - | 20 | - | - | 20 |
| CO6 | - | - | - | 32 | - | - | 32 |
|  | | | | | | | **180** |



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| **Course Code** | **20FT3018** | **Duration** | **3hrs** |
| **Course Name** | **ENZYMES IN FOOD PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Describe the structure of proteins with neat diagram. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
|  |  | Illustrate the classification of enzymes based on its catalytic activity. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Rewrite the different various factors affecting the enzyme activity. | CO2 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Interpret the mechanism of enzyme activation by alkali metal cations, alkaline earth metal cations and transition metal cations | CO4 | U | 20 |
|  |  |  |  |  |  |
| 5. | a. | Derive the Michealis-Menten equation of a substrate-enzyme  catalysed reaction. | CO3 | C | 10 |
|  | b. | Contrast the mechanical and non-mechanical methods of cell disruption. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the role of coenzymes and its classification. | CO1 | U | 10 |
|  | b. | Explain the term flocculation and flotation in enzyme separation. | CO5 | An | 10 |
|  |  |  |  |  |  |
| 7. |  | Explain the following terms in one or two sentences a). Enzyme unit (IU); b) katal; c) Turnover number; d) Prosthetic groups; e). Substrate; g). Metal ions; h) Active cite; i) Cofactor; j) Proenzyme; k) Enzyme kinetics | CO6 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | State the application of protease enzymes in food processing industries. | CO6 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Conclude the application of lipase enzymes in food processing industries. | CO6 | E | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe structure, functions and the mechanisms of action of enzymes. |
| CO2 | Uthe enzyme activity in foods. |
| CO3 | Learn kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process. |
| CO4 | Uimmobilization of enzymes. |
| CO5 | Apply the acquired skills on the applications of enzymes and their future potential. |
| CO6 | Evaluate the application of various enzymes at industry level. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **U** | **Apply** | **An** | **Evaluate** | **C** | **Total** |
| CO1 |  | 30 |  |  |  |  | 30 |
| CO2 |  |  |  | 20 |  | 20 | 40 |
| CO3 |  |  |  |  |  | 10 | 10 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 | 20 |  | 20 |  | 20 |  | 60 |
|  | | | | | | | **180** |



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| **Course Code** | **20FT3019** | **Duration** | **3hrs** |
| **Course Name** | **NEUTRACEUTICALS AND HEALTH FOODS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Nutraceuticals. Discuss in detail about chemical constituents of Nutraceuticals. | CO1 | R | 10 |
|  | b. | Discuss in detail about Nutraceutical Regulations and Application of traditional nutraceutical in chronic disease control. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write in detail about Vitamins, minerals, hormones and metabolic Antioxidants. | CO1 | Ap | 10 |
|  | b. | Distinguish about Global Market of Herbal Nutraceuticals. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define Prebiotics, enumerate in detail about Mechanism, Properties, Fermentation of Prebiotics by Gut Bacteria. | CO4 | R | 10 |
|  | b. | Explain in detail about Dairy and Non-dairy Probiotics food products. | CO4 | AP | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write in detail about Physico-chemical properties and health benefits of dietary fiber. | CO1 | C | 10 |
|  | b. | Explain in detail about various Organosulfur compounds and their properties, Sources, and Health benefits. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Recall about sources, effects of processing, absorption, metabolism and excretion of phytoestrogens. | CO6 | R | 10 |
|  | b. | Write in detail about classification and perspective of food applications of phytoestrogens. | CO2 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail about factors affecting the choice of extraction process and steps involved in the extraction of medicinal plants. | CO3 | An | 10 |
|  | b. | Summarize about aromatic plant extraction and write about modern methods of extraction. | CO5 | E | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain in detail about isolation of volatile oils, tannins, saponins. | CO6 | U | 10 |
|  | b. | Summarize about Paper chromatography, Column chromatography, Ion exchange chromatography, Gel permeation chromatography. | CO6 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain about delivery of immune modulators/vaccines through functional foods. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Relate nutrigenomics and personalized medicine. | CO3 | Ap | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the role of nutraceuticals and functional food in health and disease. |
| CO2 | Present ideas and concepts on issues of functional foods and nutraceuticals. |
| CO3 | Apply the basic concepts of nutraceuticals and functional foods, their chemical nature and methods of extraction. |
| CO4 | Acquire knowledge on probiotics and its role in disease prevention. |
| CO5 | Evaluate the standards of evidence required for efficacy and safety assessment of nutraceutical and functional foods. |
| CO6 | Know about various phytochemicals their health promotion and disease prevention. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | - | 10 | - | - | 10 | 30 |
| CO2 | 10 | - | - | 20 | - | 10 | 40 |
| CO3 | - | - | 20 | 10 | - | - | 30 |
| CO4 | 10 | - | 10 | - | - | - | 20 |
| CO5 | - | 20 | - | - | 10 | - | 30 |
| CO6 | 10 | 10 | - | - | 10 | - | 30 |
|  | | | | | | | **180** |



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| **Course Code** | **20FT3020** | **Duration** | **3hrs** |
| **Course Name** | **FOOD PACKAGING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | List the various functions, basic requirements, and levels of packaging. | CO1 | U | 10 |
|  | b. | List and discuss the intrinsic and extrinsic factors that affect the quality of the food. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the various methods of estimation of the shelf life of food. | CO2 | An | 10 |
|  | b. | Elaborate on the accelerated shelf-life testing method. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define lacquering and enlist the internal and external metal coating materials used in the coating of food containers. | CO3 | U | 10 |
|  | b. | Describe types of films and list the most important types of films used for food packaging. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the Vacuum fillers, Gravity fillers, Form fill seal machines, and Vacuum sealing machines. | CO4 | U | 10 |
|  | b. | With a neat sketch explain the working of Form Fill Seal machines. | CO4 | C | 10 |
|  |  |  |  |  |  |
| 5. | a. | Enlist the mandatory requirements that the label must carry as specified by the FSS, Packaging, and Labeling Regulation 2011. | CO5 | R | 10 |
|  | b. | Discuss the labeling, types of labels, and the printing techniques used in labeling. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Explain the various types of papers, plastic containers, and their applications in food packaging in detail. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain vacuum and inert gas packaging. | CO6 | U | 10 |
|  | b. | Elaborate on the laminated films and their typical food application. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the effect of environmental factors and biological factors on the quality of food products | CO6 | U | 10 |
|  | b. | List and explain the various tests used for packaging materials. | CO3 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain MAP and list its advantages. | CO6 | U | 10 |
|  | b. | Explain smart and intelligent packaging. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the need and functions of packaging to protect and store food. |
| CO2 | Gain knowledge on the shelf life of food and accelerated shelf-life testing. |
| CO3 | Know the different packaging materials based on their properties and their application. |
| CO4 | Learn about the filling and sealing techniques used for different food materials. |
| CO5 | Understand labeling methods and legislature. |
| CO6 | Know about the advanced food packaging techniques. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | - | - | - | 20 | - | - | 20 |
| CO3 | 30 | 10 | 10 | 10 | - | - | 60 |
| CO4 | - | 10 | - | - | - | 10 | 20 |
| CO5 | 10 | 10 | - | - | - | - | 20 |
| CO6 | - | 40 | - | - | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FT3021** | **Duration** | **3hrs** |
| **Course Name** | **WASTE RECYCLING AND RESOURCES RECOVERY SYSTEM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain in detail types of food waste and losses. | CO1 | R | 10 |
|  | b. | Write and explain all the legal provisions for handling the waste generated from urban and peri-urban areas. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the challenges involved in waste characterization obtained from food industry. | CO2 | U | 10 |
|  | b. | Explain in detail Anaerobic compositing of municipal solid waste. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Draw schematic diagram for bio gas production plant and explain its working in detail. | CO5 | An | 10 |
|  | b. | Explain solid state fermentation. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Draw a well labeled diagram for General treatment scheme for potato processing effluent. | CO4 | R | 10 |
|  | b. | Describe all the properties and their importance involved in waste characterization obtained from food industry. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the co-product recovery of valuable compounds from wastage of diary processing unit. | CO3 | U | 10 |
|  | b. | Summarize all the possible number of bio products which can be obtained by the processing of the fruit and vegetable skins. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Draw a diagram for aerated lagoons and explain its working. | CO5 | U | 10 |
|  | b. | Draw and explain Process flow chart of soluble dietary fiber production from apple pomace | CO4 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Draw an incinerator and explain the working in detail. | CO5 | U | 10 |
|  | b. | Describe the process of pectin extraction from the apple pome wastage. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss Marine industry wastewater characterization by its various physiochemical parameters. | CO3 | U | 10 |
|  | b. | Explain the primary treatment of the waste water obtained from marine processing unit. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain a case for carbon foot print generated by a meat processing plant. | CO6 | C | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify origin of waste generated in food industries. |
| CO2 | Summarize various treatment methods for food wastes. |
| CO3 | Demonstrate co product recovery from food wastes. |
| CO4 | Prioritize by product recovery for food industries. |
| CO5 | Decide suitable waste handling strategies. |
| CO6 | Develop pollution prevention mechanisms. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | - | - | - | - | - | 20 |
| CO2 | - | 30 | - | - | - | - | 30 |
| CO3 | - | 20 | - | 10 | - | - | 30 |
| CO4 | 30 | 20 | - | - | - | - | 50 |
| CO5 | - | 20 | - | 10 | - | - | 30 |
| CO6 | - | - | - | - | - | 20 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3001** | **Duration** | **3hrs** |
| **Course Name** | **FOOD CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define water in food, Structure of water, ice and water activity, and packaging. | CO1 | R | 10 |
|  | b. | Write in detail about water activity and shelf-life. | CO2 | Ap | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss in detail about physical properties of Carbohydrates. | CO3 | U | 10 |
|  | b. | Discuss in detail about chemical properties of Carbohydrates. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain in detail about physical properties of lipids. | CO4 | An | 10 |
|  | b. | Discuss in detail about refining technology of edible fats and oils. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Classification of Enzymes, pectic and cellulose enzymes. | CO2 | Ap | 10 |
|  | b. | Write in detail about Immobilized enzymes, and factors affecting enzyme activity. | CO2 | Ap | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain in detail about structure, stability, sources, bioavailability, toxicity, and reasons for the loss of vitamins Vitamin B1 and B12. | CO5 | C | 10 |
|  | b. | Explain in detail about structure, stability, sources, bioavailability, toxicity, and factors affecting the availability and transportation of Calcium. | CO5 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the classification of pigments, sources, chemistry, and applications of betalain and chlorophyll. | CO6 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Write in detail about modified Starch, cellulose, and their application in the food industry. | CO3 | U | 10 |
|  | b. | Recall about Autoxidation. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss in detail about functional properties of proteins. | CO4 | An | 20 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write in detail about structure, stability, sources, bioavailability, toxicity, reasons for the loss of vitamins in foods, and transportation of Vitamin D. | CO5 | C | 10 |
|  | b. | Explain in detail about structure, stability, sources, bioavailability, toxicity, and factors affecting the availability and transportation of potassium. | CO5 | C | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the general chemical structures of major components of foods (water, proteins,  carbohydrates, and lipids) and selected minor components (vitamins and minerals). |
| CO2 | Understand, plan, perform and analyse a range of chemical investigations with an emphasis on food analysis. |
| CO3 | Demonstrate the ability to relate the chemical composition of foods to their functional  Properties. |
| CO4 | Examine a molecular rationalization for the observed physical properties, and reactivity of  major food components. |
| CO5 | Evaluate and determine the approaches that may be used to control the reactivity of those  food components that are likely to impact the overall quality of finished products. |
| CO6 | Predict how changes in overall composition are likely to change the reactivity of individual  food components. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | - | - | - | - | - | 10 |
| CO2 | - | - | 30 | - | - | - | 30 |
| CO3 | - | 30 | - | - | - | - | 30 |
| CO4 | 10 | - | - | 30 | - | - | 40 |
| CO5 | - | 10 | - | - | - | 40 | 50 |
| CO6 | - | - | - | 20 | - | - | 20 |
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| **Course Code** | **22FT3002** | **Duration** | **3hrs** |
| **Course Name** | **FOOD AND INDUSTRIAL MICROBIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | State the factors affecting the growth characteristics of bacteria in foods. | CO1 | R | 10 |
|  | b. | Predict the growth phases of bacteria noticed in batch culture system. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Report the spoilage effect of microorganisms in various foods. (i) Meat spoilage (ii) Fruit and Vegetable spoilage. | CO2 | A | 12 |
|  | b. | Draw a flowchart for the MPN test to check the quality of potable water. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Describe the pathogenic mechanisms, diagnosis, treatment and control measures of Salmonellosis. | CO3 | A | 10 |
|  | b. | Differentiate GMP and GHP. Organize the steps followed in GHP in food industries to overcome the food borne disease spread. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discover the methods followed in improvement of industrial strains. | CO4 | A | 10 |
|  | b. | Correlate the culture conditions and their importance in fermentation process. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Sketch a neat diagrammatic representation of citric acid production with a highlight on the fermentation conditions for better yield. | CO5 | A | 15 |
|  | b. | Mention the applications of amylase enzyme in food processing. | CO5 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Prepare a neat flow chart for an industrial production of Vitamin B12 with its applications. | CO5 | A | 10 |
|  | b. | Define single cell protein. Classify types and *Spirulina* production in detail. | CO5 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Summarize the steps followed in PCR for the detection of food borne disease causing microorganisms. | CO3 | E | 15 |
|  | b. | Predict the algal toxins and intoxication. | CO3 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Criticize the freeze drying process with a special mention about the role of components of freeze dryer and applications. | CO6 | E | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Define Spray drying. Write the working principle and stages of drying process with a diagrammatic representation. | CO6 | C | 20 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the beneficial and spoilage microorganisms associated with foods. |
| CO2 | Understand the role of microorganisms in water and food commodities. |
| CO3 | Examine the role of causative agents and pathogenesis of disease-causing food-borne pathogens and their toxins. |
| CO4 | Illustrate the media formulation, sterilization and culture conditions for the development of suitable strain for industrial fermentation. |
| CO5 | Evaluate the industrial production of organic acids, amino acids, Vitamins, and Polysaccharides. |
| CO6 | Comprehend the techniques and underlying principle of downstream processing. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 |  | 8 | 12 |  |  |  | 20 |
| CO3 |  |  | 10 | 10 | 20 |  | 40 |
| CO4 |  |  | 10 | 10 |  |  | 20 |
| CO5 |  |  | 25 | 10 | 5 |  | 40 |
| CO6 |  |  |  |  | 20 | 20 | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3003** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF FOOD PRESERVATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Briefly discuss the undesirable changes in food due to spoilage and also discuss about factors affecting food spoilage. | CO1 | U | 10 |
|  | b. | Classify the food based on ease of spoilage with suitable example and summaries the factors affecting growth of microorganisms | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the types of blanching of fruits and vegetables. | CO2 | A | 10 |
|  | b. | Briefly discuss about HTST pasteurization with neat diagram. | CO3 | A | 10 |
| 3. | a. | Briefly discuss about principles of freezing using freezing curve and also explain thawing process. | CO3 | U | 10 |
|  | b. | Categorize the methods of freezing with a special highlight about the effect of freezing on fruits and vegetables. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the factors affecting dehydration process and discuss the changes in food material during dehydration process. | CO2 | An | 10 |
|  | b. | Sketch a neat flow diagram of spray drying of liquid foods with a special mention about advantages and disadvantages. | CO4 | A | 10 |
| 5. |  | Explain the mechanism of action of any five preservatives used in foods. | CO6 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain working principle of single screw extruder with neat sketch. | CO4 | An | 10 |
|  | b. | Describe the factors affecting extrusion cooking. | CO5 | U | 10 |
| 7. | a. | Write the causes of spoilage of canned food. | CO1 | U | 10 |
|  | b. | Describe the classification of chemical preservatives according to FSSAI. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Briefly explain the ultrasound equipments with neat sketch. | CO6 | An | 10 |
|  | b. | Discuss the inactivation mechanism of microorganisms using UV light. | CO5 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain principles of HPP and also explain the applications of HPP in food industry. | CO6 | A | 10 |
|  | b. | List the advantages and disadvantages of pulsed electric field. | CO5 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the basic principles involved in food preservation. |
| CO2 | Understand the various processing methods. |
| CO3 | Comprehend suitable techniques for the preservation of various foods. |
| CO4 | Apply the modern technologies of food preservation in industry. |
| CO5 | Analyze the conventional and novel preservation techniques. |
| CO6 | Evaluate and suggest proper preservation methods and equipment. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 30 | - | - | - | - | 30 |
| CO2 | - | - | 10 | 10 | - | - | 20 |
| CO3 | - | 20 | 10 | 10 | - | - | 40 |
| CO4 | - | - | 10 | 10 | - | - | 20 |
| CO5 | - | 20 | - | 10 | - | - | 30 |
| CO6 | - | - | 10 | 30 | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3004** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recall the structure of paddy with a neat and labelled diagram. | CO1 | R | 10 |
|  | b. | Assess the effect of parboiling on milling, cooking and nutritional quality of paddy rice. | CO2 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the various by-products of wheat. | CO4 | U | 10 |
|  | b. | Compile the different methods of bulgur production. | CO2 | C | 10 |
|  |  |  |  |  |  |
| 3. | a. | Examine the manufacturing process of puffed rice with a flowchart. | CO3 | A | 10 |
|  | b. | Categorize the different methods of paddy parboiling. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Identify the steps involved in dry milling of corn with a flow diagram. | CO4 | R | 10 |
|  | b. | Construct the process flow chart for the manufacture of HFCS. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Discuss the wet and dry pulse milling methods. | CO5 | U | 10 |
|  | b. | Elaborate the important unit operations in pulse milling. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Assess the process of making tortillas from fresh masa. | CO2 | E | 10 |
|  | b. | Discuss the manufacturing process of popcorn. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the CFTRI method of pulse milling. | CO5 | A | 10 |
|  | b. | Explain the general points to be considered to increase the pulse milling outturn. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Appraise the refining of crude rice bran oil into edible grade oil. | CO6 | E | 10 |
|  | b. | Describe ANY FOUR processes to produce quick cooking rice. | CO2 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the different oil extraction methods. | CO2 | U | 10 |
|  | b. | Appraise the compression curves and pressures in screw barrels with supporting diagrams. | CO3 | An | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the basic concept of cereals, pulses and oil seeds processing. |
| CO2 | Understand the various unit operations involved in milling. |
| CO3 | Analyze and select suitable equipment for milling. |
| CO4 | Apply the knowledge to process grains into value-added products. |
| CO5 | Create new products from pulses and legumes. |
| CO6 | Gain knowledge on converting the waste into wealth. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 |  |  |  |  |  | 10 |
| CO2 | 10 | 20 |  | 10 | 20 | 10 | 70 |
| CO3 |  |  | 10 | 10 |  |  | 20 |
| CO4 | 10 | 10 | 10 | 10 |  |  | 40 |
| CO5 |  | 10 | 20 |  |  |  | 30 |
| CO6 |  |  |  |  | 10 |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3005** | **Duration** | **3 hrs** |
| **Course Name** | **TECHNOLOGY OF FRUITS AND VEGETABLE PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write all the advantages for pre-cooling of fruits and vegetables depend. | CO4 | An | 10 |
|  | b. | Outline the processing steps used for converting a fruit to a juice on industrial scale. | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | With respect to the Indian fruit and vegetable processing industry, Analyze SWOT. | CO3 | U | 10 |
|  | b. | Explain in detail process of hydro-cooling fruits and vegetables. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Along with a neat diagram discuss the process of aseptic packaging. | CO5 | U | 10 |
|  | b. | Enlist all the potential advantages and challenges/ disadvantages in MAP. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain in detail about Controlled atmospheric storage. | CO5 | U | 10 |
|  | b. | Explain the principle and mechanism behind Osmotic dehydration and factors involved in it. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe in detail all the three types of canning processes. | CO5 | R | 10 |
|  | b. | Explain in detail about Modified Atmosphere Packaging. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Enlist and explain factors responsible considered during the Evaporation of fruit pulps. | CO2 | R | 10 |
|  | b. | Describe concentration using membranes for fruit juices. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain pickling process and enlist the defects occurring in pickles. | CO4 | R | 10 |
|  | b. | Draw the technological processing flowchart for the RTS production and give FSSAI specifications. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the canning process for baby corn in detail along with processing flowchart. | CO6 | U | 10 |
|  | b. | Enlist all the factors on which pre-cooling of fruits and vegetables depend. By which the post-harvest losses can be minimized. | CO1 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 9. |  | Describe the technological flow chart for the production of Jelly. And note the defects and remedies while processing the Jelly. | CO6 | R | 20 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Acquire knowledge of different physical, chemical and nutritional properties of fruits and vegetables. |
| CO2 | Acquire insight into the various chemical and biochemical changes that occur during processing. |
| CO3 | Learn various ways of designing and monitoring processing chains |
| CO4 | Gain thorough knowledge about laws, regulations and the monitoring agencies involved in food safety and labeling of fruits and vegetables. |
| CO5 | Understand the methods of packaging, shelf life and related factors in the processing of fruits and vegetables. |
| CO6 | Know how fruits and vegetables are processed in industries. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 20 | - | 10 | - | - | 40 |
| CO2 | 10 | - | - | - | - | - | 10 |
| CO3 | - | 20 | - | - | - | - | 20 |
| CO4 | 10 | 10 | - | 10 | - | - | 30 |
| CO5 | 10 | 30 | - | - | - | - | 40 |
| CO6 | 20 | 20 | - | - | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3006** | **Duration** | **3hrs** |
| **Course Name** | **BAKERY AND CONFECTIONARY TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recognize the different types of cream used in bakery and confectionary industry. | CO1 | R | 10 |
|  | b. | Classify the flavoring materials used in bakeries. Point out the important points to be kept in mind while using and storing flavoring materials. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the use of flour improvers and emulsifiers in bakery industry. | CO1 | U | 10 |
|  | b. | Breakdown the different types of milk and animal fat used in baked products and point out the functions of fat in baked products. | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the different types of sugar used to sweeten bakery products with special emphasis on castor sugar, loaf sugar, brown sugar, treacle and invert syrup. | CO1 | U | 10 |
|  | b. | Describe the composition of egg, types of egg and tests used to judge the quality of eggs used in baked products. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Appraise about the internal and external characteristics of bread. | CO3 | An | 10 |
|  | b. | Discuss the types of cookies, major faults associated in making the cookies and their causes. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Distinguish between cookies and biscuits. | CO2 | An | 10 |
|  | b. | Break down the process of noodle manufacture. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the manufacture process of nutria grain bars. | CO5 | U | 10 |
|  | b. | Summarize the production process of flaked products. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the manufacturing process of jellies & jujubes with neat flowcharts. | CO5 | A | 10 |
|  | b. | Illustrate the manufacturing methods of marshmallows with neat flowchart. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Illustrate the different stages of sugar syrup with reference to their properties and corresponding temperatures. | CO4 | A | 10 |
|  | b. | Describe the defects in the toffee manufacture process. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Enumerate the types of chocolate and summarize the method of manufacturing chocolates. | CO6 | U | 10 |
|  | b. | Describe the manufacture process of toffees. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the various ingredients used in the baking industry. |
| CO2 | Study the processes involved in baking technology. |
| CO3 | Understand the factors affecting the quality of baked and confectionery products. |
| CO4 | Design products with better quality. |
| CO5 | Learn about the process involved in confectionery products. |
| CO6 | Get exposure to the different parameters involved in the scale-up of bakery products production. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 20 | - | 20 | - | - | 60 |
| CO2 | - | - | - | 20 | - | - | 20 |
| CO3 | - | 10 | - | 10 | - | - | 20 |
| CO4 | - | - | 10 | - | - | - | 10 |
| CO5 |  | 30 | 20 |  |  |  | 50 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3007** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF PLANTATION CROPS AND SPICES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the process of decaffeination of green coffee with comparison to water, organic solvents and carbon dioxide. | CO6 | U | 10 |
|  | b. | Explain fermentation process in coffee processing and changes during fermentation. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain grinding process and packaging of coffee. | CO2 | An | 10 |
|  | b. | Demonstrate the dry processing method of green coffee with a flow diagram. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Classification of tea and briefly explain green tea, white tea, green brick tea and dark tea. | CO3 | U | 10 |
|  | b. | Analyze the biochemical changes that take place during withering and fermentation of tea leaves. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the steps involved in manufacturing of instant tea. | CO3 | C | 10 |
|  | b. | Explain sorting and quality determination of cocoa. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Elaborate the processing steps involved in primary and secondary products of ginger. | CO4 | U | 10 |
|  | b. | Illustrate the flow chart for cardamom processing and explain drying methods. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail about post-harvest processing of turmeric and its quality specification with respect to Indian standards. | CO5 | E | 10 |
|  | b. | Explain briefly about palm oil processing with flow chart. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the steps involved in coconut processing with flow chart. | CO6 | R | 10 |
|  | b. | Explain the post-harvest technology and quality specifications of black and white pepper. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Elaborate on the steps involved in the garlic dehydration process with flowchart. | CO4 | C | 20 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the steps involved in cinnamon processing. | CO4 | E | 10 |
|  | b. | Categorize the quality specifications for cumin seeds, powder and volatile oil. | CO5 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the chemistry of plantation crops and spice processing. |
| CO2 | Recall the various unit operations involved in processing. |
| CO3 | Explore the suitable techniques for coffee and tea processing |
| CO4 | Develop processes for spice processing |
| CO5 | Learn the techniques of extraction of oleoresins from spices |
| CO6 | Create new plantation based products |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | - | 20 | - | - | 20 |
| CO2 | - | 10 | - | 20 | - | - | 30 |
| CO3 | - | 20 | - | - | - | 10 | 30 |
| CO4 | - | 30 | - | - | 10 | 20 | 60 |
| CO5 | - | - | - | 10 | 10 | - | 20 |
| CO6 | 10 | 10 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3008** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF MILK AND MILK PRODUCTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recommend the various unit operations involved in the HTST method of pasteurization of milk and explain with the help of a flow chart. | CO2 | E | 12 |
|  | b. | Interpret the quality tests performed on milk to detect adulteration, heat and microbial stability. | CO2 | A | 8 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Construct a double stage homogenizer and explain its working principle. | CO4 | A | 10 |
|  | b. | Extend on the method of manufacture of Reconstituted and Flavored milk. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the construction and working principle of centrifugal cream separator. | CO4 | U | 12 |
|  | b. | Evaluate the effect of various factors on the physico-chemical properties of cream. | CO1 | E | 8 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Criticize the three principles of continuous butter making process and extend on the phase reversal process. | CO2 | E | 12 |
|  | b. | Define butter according to PFA standards and classify its types. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | Determine the operations involved in the preparation of cream for butter manufacturing. | CO2 | A | 10 |
|  | b. | Compare the direct cream method and creamery butter method of ghee production in terms of fat recovery. | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Organize the unit operations to be carried out in the manufacture of cheddar cheese with a help of flow chart. | CO2 | An | 15 |
|  | b. | 100 kg of milk testing 7.5 % fat is used to produce 14.1 kg of cream testing 52.5 % fat. Define and determine the skimming efficiency for the given problem. | CO4 | A | 5 |
|  |  |  |  |  |  |
| 7. | a. | Examine the steps involved in the manufacture of ice cream in detail. | CO2 | A | 15 |
|  | b. | Identify the defects caused in cheese and predict its preventive measures. | CO5 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Illustrate the process involved in the production of milk powder using drum driers. | CO4 | U | 12 |
|  | b. | Recommend the various methods to improve the solubility of milk powder. | CO2 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Examine the method of manufacture of following milk products with a help of a flow chart.  (i) Shrikhand (ii) Khoa (iii) Paneer (iv) Rasagulla | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To gain knowledge on properties and composition of milk. |
| CO2 | To understand the processing techniques of milk. |
| CO3 | To learn the different milk products manufacturing. |
| CO4 | To understand the equipment used in dairy products manufacturing. |
| CO5 | To learn the packaging and storage of various milk products. |
| CO6 | To acquire knowledge on the Indian dairy products and their manufacturing |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | - | - | 8 | - | 8 |
| CO2 | - | - | 33 | 15 | 32 | - | 80 |
| CO3 | - | 18 | - | - | 10 | - | 28 |
| CO4 | - | 24 | 15 | - | - | - | 39 |
| CO5 | - | 5 | - | - | - | - | 5 |
| CO6 | - | - | - | 20 | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3009** | **Duration** | **3hrs** |
| **Course Name** | **NUTRITION AND METABOLISM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | List the vitamins with their application and also explain the functions of nutrition. | CO1 | U | 10 |
|  | b. | List the nutritional assessment method of individual and explain biochemical and laboratory methods of assessment. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Briefly discuss about digestion of food, assimilation and transportation of nutrient. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Briefly discuss about malnutrition and its problems and also explain the vitamin A disorder. | CO3 | U | 10 |
|  | b. | List the inherent toxins, main food sources and major toxicity symptoms. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Briefly discuss about regulators, inhibitors and important anabolic reactions of TCA cycle. | CO3 | An | 10 |
|  | b. | Explain two phases of glycolysis with flow chart. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain two distinct phases of pentose phosphate pathway. | CO4 | U | 10 |
|  | b. | Briefly discuss about electron transport chain (ETC). | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the degradation of fatty acids. | CO5 | U | 10 |
|  | b. | Explain about Oxidative Phosphorylation. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Explain biosynthesis and degradation of urea cycle. | CO5 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Briefly discuss about synthesis, degradation and metabolic disorders of glycine. | CO6 | E | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPUSLORY QUESTION** | | | | | |
| 9. | a. | Briefly discuss the pediatric nutrition. | CO6 | U | 10 |
|  | b. | Briefly discuss the theory of ageing and stages of ageing. | CO6 | U | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of nutrition and metabolism of the major macromolecules. |
| CO2 | Describe the biochemistry process, the basic concept of human nutrition, and the relationship of the consumption of foods to nutritional status and health. |
| CO3 | Apply their knowledge in food biochemistry and nutrition in designing a new range of products with improved nutritional characteristics. |
| CO4 | Analyze the stages in the catabolism of food molecules and describe what occurs during each stage. |
| CO5 | Evaluate the biological functions of foods for health in addition to nutritional values. |
| CO6 | Formulate specialized nutrition for pediatric, geriatric, and sports needs. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | - | 30 | - | - | - | - | 30 |
| CO3 | - | 10 | - | 10 | - | - | 20 |
| CO4 | - | 20 | - | 10 | - | - | 30 |
| CO5 | - | 20 | - | 20 | - | - | 40 |
| CO6 | - | 20 | - | - | 20 | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3010** | **Duration** | **3hrs** |
| **Course Name** | **FOOD QUALITY SYSTEMS AND MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Food quality and enlist four main important parameters of food quality. | CO1 | U | 10 |
|  | b. | Differentiate between the QC and QA. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the adulteration and contamination with examples. | CO4 | U | 10 |
|  | b. | Explain the intrinsic and extrinsic factors involved in food quality. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Enlist and explain the tools used for TQM. | CO2 | R | 10 |
|  | b. | Explain all the terminologies in GAP. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Summarize all the seven principles of HACCP. | CO3 | R | 10 |
|  | b. | Enlist principles of Quality Management ISO 9000:2015. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Summarize the offences and penalties for the food fraud. | CO5 | U | 10 |
|  | b. | Explain all the labeling norms as per FSSAI 2011. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the Functioning and responsibilities of the WTO. | CO6 | R | 10 |
|  | b. | Explain the organizational structure of FSSAI. | CO5 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the PDCA cycle with well labeled diagram and all its components. | CO2 | U | 10 |
|  | b. | Write a short note on sensory analysis specifying all the human senses involved in it. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Enlist all the facilities addressed by Good Manufacturing Practices. | CO5 | R | 10 |
|  | b. | Summarize clause 8 and all its sub clauses as per ISO 22000:2018. | CO2 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Write a detailed report on the auditable clauses for implementing ISO 22000:2018 in Marine processing industry. | CO6 | C | 20 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Know the quality attributes of food and their analysis methods. |
| CO2 | Evaluate the structure and processes of quality management systems. |
| CO3 | Gain knowledge about HACCP and its implementation. |
| CO4 | Familiar with food safety, food contamination, and food adulteration. |
| CO5 | Learn the history, importance, and concepts of food regulations. |
| CO6 | Understand the global and domestic food safety standards. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 30 | - | - | - | - | 30 |
| CO2 | 20 | 30 | - | - | -- | - | 50 |
| CO3 | 10 | 10 | - | - | - | - | 20 |
| CO4 | - | 10 | - | - | - | - | 10 |
| CO5 | 30 | 10 | - | - | - | - | 40 |
| CO6 | 10 | - | - | - | - | 20 | 30 |
|  | | | | | | | **180** |



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| **Course Code** | **22FT3017** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF MEAT, POULTRY, AND FISH PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the post mortem chemistry of muscles. | CO6 | R | 10 |
|  | b. | Describe the fat composition and its modifiers. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the Operational factors affecting meat quality. | CO5 | R | 10 |
|  | b. | Explain the methods used for meat tenderization. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Summarize the salient points related to meat plant hygiene. | CO4 | U | 10 |
|  | b. | Classify various types of Sausages. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the microbiological safety of poultry products. | CO5 | U | 10 |
|  | b. | Describe the processing steps involved for poultry. | CO3 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the factors affecting quality of eggs along with the measurement techniques used. | CO5 | U | 10 |
|  | b. | Describe the microbial spoilage of eggs. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the ante mortem handling, and welfare of animals. | CO3 | U | 10 |
|  | b. | Describe the preparation of various egg products. | CO3 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Classify Offals. Also explain any five offals. | CO3 | U | 10 |
|  | b. | Explain various types of stunning methods for meat animals. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain methods used for tenderization of meat. | CO5 | U | 10 |
|  | b. | Explain Meat composition from different sources. | CO1 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe various processing operations for shellfish. | CO3 | R | 10 |
|  | b. | Explain the factors which contribute to spoilage of fish. | CO5 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Understand the composition of flesh foods. |
| CO2 | Learn the types and grades of meat, poultry, and sea foods. |
| CO3 | Explain processing techniques used for the production of commercial meat, poultry, and sea foods. |
| CO4 | Understand meat plant sanitation, hygiene, and standards. |
| CO5 | Assess the factors that affect the quality of meat. |
| CO6 | Evaluate the processing techniques and their effect on nutritional value. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | -- | -- | -- | -- | 20 |
| CO2 | -- | 20 | -- | -- | -- | -- | 20 |
| CO3 | 30 | 40 | -- | -- | -- | -- | 70 |
| CO4 | -- | 10 | -- | -- | -- | -- | 10 |
| CO5 | 10 | 40 | -- | -- | -- | -- | 50 |
| CO6 | 10 | -- | -- | -- | -- | -- | 10 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **22FT3018** | **Duration** | **3hrs** |
| **Course Name** | **FOOD PACKAGING TECHNOLOGY** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recognize the levels of packaging and point out the environments for which a packaging material is designed. | CO1 | R | 10 |
|  | b. | Discuss on the reasons for food spoilage and highlight the rationale behind packaging. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Deduce how plastic packaging material are tested for strength and use in food systems. | CO2 | An | 10 |
|  | b. | Breakdown the tests used for measuring the travel worthiness of a packaging material. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the Draw-and-wall-iron (DWI) and Draw-and-redraw (DRD) process of manufacturing aluminum cans. | CO3 | A | 10 |
|  | b. | Describe the Bag-on-valve system used in the manufacture of aerosol cans with a neat sketch. Recall the application of aerosol cans in food systems. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate the Blow and blow (B&B) and Press and blow (P&B) process of manufacturing glass containers. | CO3 | A | 10 |
|  | b. | Discuss the various surface treatments that can be given to improve the strength and finish of glass containers. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Classify polymers used in food packaging. | CO3 | An | 10 |
|  | b. | Contrast between injection molding, blow molding, extrusion blow molding, injection blow molding and stretch blow molding. Use sketches wherever applicable. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the various converting processes carried out to finish paper. | CO4 | U | 10 |
|  | b. | Point out the need for labelling w.r.t manufacturers perspective. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Point out the basic requirements of a label as per FSSA, 2006. | CO5 | An | 10 |
|  | b. | Classify the different types of paper and paperboards that are used in manufacture of packaging for food systems. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Design a label for a sausage pack, point out the mandatory and voluntary information that are put up as per consumer and legislative need. | CO5 | C | 10 |
|  | b. | Recommend a packaging system for fresh cut pork chops with justification. | CO6 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Point out the different gases and equipment used in modified atmosphere packaging. | CO6 | An | 10 |
|  | b. | Discuss the various vacuum packaging systems used for food system. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Study the need and functions of packaging to protect and store food. |
| CO2 | Gain knowledge on the shelf life of food and accelerated shelf-life testing. |
| CO3 | Know the different packaging materials based on their properties and their application. |
| CO4 | Learn about the filling and sealing techniques used for different food materials. |
| CO5 | Interpret labeling methods and legislature. |
| CO6 | Know about the advanced food packaging techniques. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 |  |  |  | 20 |  |  | 20 |
| CO3 |  | 20 | 20 | 20 |  |  | 60 |
| CO4 |  | 10 |  | 10 |  |  | 20 |
| CO5 |  |  |  | 20 |  | 10 | 30 |
| CO6 |  | 10 |  | 10 | 10 |  | 30 |
|  | | | | | | | **180** |