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| **Course Code :** | **10FP301** | **Duration :** | **3hrs** |
| **Course Name :** | **FOOD SAFETY REGULATIONS AND CONTROL** | **Max. marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | |
| 1. |  | Formulate a label for a Ready to Eat Mango Beverage developed at the Food Processing & Training Centre, Karunya University w.r.t to the consumer’s perspective. (A Sketch of the Label should be provided at the end of the discussion) | 20 |
| **(OR)** | | | |
| 2. | a. | Anticipate the different labeling considerations to be taken into account while designing a label for products to be sold within the European Union as per the manufacturer’s perspective. ***(Cover all statutory requirements and guidelines while evaluating the label)*** | 15 |
| b. | Define the term “Due Diligence” w.r.t Food Labelling. | 5 |
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| 3. |  | Summarise the role and objectives of AGMARK (All Grade Prescriptions, Powers & Penalties to be discussed). | 20 |
| **(OR)** | | | |
| 4. |  | Summarise the role and objectives of MMPO (Discuss its provisions and how it regulated the Milk Production prior to FSSA,2006). | 20 |
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| 5. | a. | In the scenario of a vacancy in the Food Safety & Standards Authority of India, how is the vacancy filled and what are the protocols to be followed? | 10 |
| b. | Reconstruct the Operational structure of the Food Safety & Standards Authority of India. Emphasis must be on the members of FSSA and the working of SC, SP and CAC. | 10 |
| **(OR)** | | | |
| 6. | a. | State the basic difference between an unsafe and misbranded. | 5 |
| b. | Summarise the Guidelines for drinking water as per BIS. (Product Description, Sampling Technique and Production Principles to be defined) | 15 |

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| 7. |  | | | List any 2 CCPs in the below mentioned flowchart for production of Fruit Wine. Defend your selection of CCPs based on the Decision Tree Method.  y2515e08_12.gif | 20 |
| **(OR)** | | | | | |
| 8. | |  | Role-play the various tasks that are done prior to conducting a Hazard analysis while implementing a HACCP Programme at any Food Industry. | | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | | a. | Paraphrase the functions of the different organs of WHO. | | 10 |
| b. | Summarise the role of Codex Alimentarius in the development of World Food Regulations. | | 10 |



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| **Course Code** | **10FP302** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL TECHNIQUES OF FOOD ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Summarize various mechanisms involved in the separation of mixtures in chromatography techniques. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Demonstrate the working of FID and TCD detector used in Gas chromatography with a neat diagram. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | Distinguish near-infrared spectroscopy from far-infrared spectroscopy. | CO2 | A | 10 |
| b. | Summarize various types of molecular vibrations. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain with a neat sketch the components and functions of IR spectrophotometer. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Demonstrate the working principle of Atomic Emission Spectroscopy with a neat sketch. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Summarize various methods of excitation in atomic emission Spectroscopy. | CO3 | E | 20 |
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| 7. | a. | State the limitations of NMR in terms of spin quantum number. | CO4 | R | 5 |
| b. | Summarize 1H and 13C NMR for the prediction of molecular structure. | CO4 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Compile native and denatured PAGE electrophoresis for the prediction of molecular weight of the protein with neat sketch. | CO5 | C | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Describe the instrumentation and applications of water activity meter and texture analyzer. | CO6 | U | 20 |

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|  | **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 | --- | 20 | 20 | --- | --- | --- | 40 |
| CO2 | --- | 20 | 10 | 10 | --- | --- | 40 |
| CO3 | 20 | --- | --- | --- | 20 | --- | 40 |
| CO4 | 5 | 15 | --- | --- | --- | --- | 20 |
| CO5 | --- | --- | --- | --- | --- | 20 | 20 |
| CO6 | --- | 20 | --- | --- | --- | --- | 20 |
|  | | | | | | | **180** |

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| **Course Code** | **12FP243/14FP2037/18FP2044/17FP2044** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF PACKAGING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | In food systems \_\_\_\_\_\_\_\_\_\_\_ functions as a “silent salesman”. | | CO1 | U | | 1 |
| 2. | Microorganism that grown within a optimum temperature between 55°C and 65°C are referred to as \_\_\_\_\_\_\_\_\_\_\_. | | CO1 | Ap | | 1 |
| 3. | \_\_\_\_\_\_\_\_\_\_\_ around the can body maintains the can strength while using thinner steel. | | CO2 | R | | 1 |
| 4. | \_\_\_\_\_\_\_\_\_\_\_ propellant is used for ultra-high temperature sterilized cream. | | CO2 | R | | 1 |
| 5. | \_\_\_\_\_\_\_\_\_\_\_ are scratches resulting from careless container handling. | | CO2 | U | | 1 |
| 6. | The rubber–sulfur reaction that retained the elasticity of rubber is known as \_\_\_\_\_\_\_\_\_\_\_. | | CO3 | U | | 1 |
| 7. | In terms of chemical composition polymers are defined as \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_. | | CO1 | U | | 1 |
| 8. | \_\_\_\_\_\_\_\_\_\_\_ is a process of continuously forcing a molten material through a shaping device. | | CO3 | R | | 1 |
| 9. | \_\_\_\_\_\_\_\_\_\_\_ is a sheeting having a nominal thickness not greater than 0.25 mm. | | CO1 | R | | 1 |
| 10. | Predict the major disadvantage of coextruded films. | | CO5 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define the levels of packaging. | | CO1 | | R | 3 |
| 12. | Recall the package environments that a package should be designed for. | | CO1 | | R | 3 |
| 13. | Describe the material of construction and processes through which two-piece aluminum cans are made. | | CO2 | | U | 3 |
| 14. | Point out the basic difference between the DWI & DRD process of can making. | | CO2 | | An | 3 |
| 15. | Diagnose the causes of breakage in glass bottles. | | CO2 | | Ev | 3 |
| 16. | State the typical composition of a soda-lime glass. | | CO3 | | 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 the functions of food packaging. | CO1 | | U | 4 |
|  | b. | Summarize how food spoils with respect to chemical, physical and microbiological changes. | CO1 | | E | 8 |
| 18. | a. | Classify powders used in food systems. | CO1 | | An | 4 |
|  | b. | Explain the Draw-and-wall-iron (DWI) process and the Draw- and-redraw (DRD) process for can manufacture with neat diagrams. | CO3 | | An | 8 |
| 19. | a. | Demonstrate the uses of epoxy-phenolic and vinyl compounds, acrylic and butadiene Lacquers used for food applications. | CO2 | | A | 6 |
|  | b. | Classification polymers based on molecular structure. | CO2 | | U | 6 |
| 20. | a. | Illustrate with diagrams the two basic processes that are used to make glass containers on the IS machines. | CO2 | | A | 8 |
|  | b. | Enumerate the different surface treatments that are used to increase the strength of a newly made glass container. | CO3 | | R | 4 |
| 21. | a. | Evaluate the different gases used in MAP. | CO5 | | E | 6 |
|  | b. | Distinguish the different equipment for MAP of foods. | CO5 | | An | 6 |
| 22. | a. | Describe the tests methods used to check logistical efficiency of plastic packaging systems. | CO6 | | U | 6 |
|  | b. | Summarize the methods used to measure gas and water vapor permeability. | CO6 | | U | 6 |
| 23. |  | Summarize the various vacuum packaging systems used for foods. | CO4 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Point out the various active packaging systems used in food. | CO5 | | An | 8 |
|  | b. | Appraise the need for chilling food systems. | CO1 | | An | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | To understand food quality and need food packaging. |
| CO2 | To classify food packaging design strategies and framework. |
| CO3 | To explain the manufacturing process of various packaging materials. |
| CO4 | To select common methods of sealing of various food packaging materials. |
| CO5 | To apply the knowledge on advance food packaging methods and their applications in industry. |
| CO6 | To adapt the principle and need for testing of packaging materials. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 6 | 1 | 8 | 8 | - | **30** |
| CO2 | 2 | 10 | 14 | 3 | 3 | - | **32** |
| CO3 | 8 | 1 |  | 8 |  | - | **17** |
| CO4 | 12 |  |  |  |  | - | **12** |
| CO5 |  | 1 |  | 14 | 6 | - | **21** |
| CO6 | 12 |  |  |  |  | - | **12** |
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| **Course Code** | **14FP2005/17FP2010/18FP2010** | **Duration** | **3hrs** |
| **Course Name** | **HEAT AND MASS TRANSFER** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | State the driving force for heat transfer through solids. | | CO1 | R | | 1 |
| 2. | The critical thickness of insulation for cylindrical tube is \_\_\_\_\_\_\_\_\_. | | CO2 | U | | 1 |
| 3. | In forced convection Nusselt number is a function of \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_. | | CO3 | R | | 1 |
| 4. | Heat transfer coefficient for \_\_\_\_\_\_\_\_\_ wise condensation will be more. | | CO3 | U | | 1 |
| 5. | The absorptivity of perfect black body is equal to \_\_\_\_\_\_\_\_\_ | | CO4 | R | | 1 |
| 6. | Identify the type of flow, when both hot and cold fluids travel in the same direction. | | CO3 | R | | 1 |
| 7. | \_\_\_\_\_\_\_\_\_ gradient is responsible for molecular diffusion in fluids | | CO4 | U | | 1 |
| 8. | The unit of mass transfer coefficient is \_\_\_\_\_\_\_\_\_. | | CO5 | R | | 1 |
| 9. | According to penetration theory, the rate of mass transfer is directly proportional to square root of \_\_\_\_\_\_\_\_\_. | | CO5 | U | | 1 |
| 10. | In laminar sublayer \_\_\_\_\_\_\_\_\_ diffusion is the only mass transfer mechanism. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State Fourier’s law of heat conduction. | | CO1 | | R | 3 |
| 12. | Differentiate free and forced convection. | | CO2 | | U | 3 |
| 13. | Relate black body and grey body in terms of emissivity. | | CO3 | | An | 3 |
| 14. | Explain Log Mean Temperature Difference. | | CO4 | | U | 3 |
| 15. | Compare heat flux and mass flux. | | CO5 | | An | 3 |
| 16. | Summarize the limitations of surface renewal theory. | | 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. |  | Explain in detail the conduction in cylindrical pipes and rectangular slabs with neat sketches. | CO2 | | U | 12 |
| 18. |  | Explain various regimes of boiling with boiling curve. | CO3 | | An | 12 |
| 19. | a. | Reproduce the equation for radiation heat transfer coefficient. | CO6 | | R | 6 |
| b. | Compare and contrast Grey body with black body. | CO6 | | A | 6 |
| 20. |  | Summarize the construction and operation of 1,1 shell and tube heat exchanger. | CO4 | | E | 12 |
| 21. |  | Deduce a molar flux equation for a stagnant diffusion and equimolar counter diffusion process. | CO5 | | A | 12 |
| 22. |  | 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 |
| 23. | 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. | Define thermal conductivity of the materials. | CO1 | | R | 2 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Criticize the two-film theory and penetration theory on interphase mass transfer process. | CO5 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic laws of heat transfer and account for the consequence of heat transfer in thermal analyses of engineering systems. |
| CO2 | Analyze problems involving steady state heat conduction in simple geometries. |
| CO3 | Evaluate heat transfer coefficients for natural convection. |
| CO4 | Analyze heat exchanger performance by using the method of log mean temperature difference. |
| CO5 | Analyze heat exchanger performance by using the method of heat exchanger effectiveness. |
| CO6 | Understand the influence of radiation in food processing operations |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 |  |  |  |  |  | 6 |
| CO2 |  | 16 |  |  |  |  | 16 |
| CO3 | 2 | 1 |  | 15 |  |  | 18 |
| CO4 | 1 | 4 | 10 |  | 12 |  | 27 |
| CO5 | 1 | 1 | 24 | 3 | 12 |  | 41 |
| CO6 | 6 | 4 | 6 |  |  |  | 16 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | \_\_\_\_\_\_\_\_\_ is the ex officio Commissioner of Food Safety of India. | | CO1 | R | | 1 |
| 2. | Point out the legislation enacted by GoI as a central legislation in the year 1937 to grade and market agricultural produce. | | CO1 | An | | 1 |
| 3. | The Codex Alimentarius establishes \_\_\_\_\_\_\_\_\_ levels for residues of veterinary drugs in foods. | | CO3 | R | | 1 |
| 4. | Designation of host countries for the committees is a standing item on the agenda for the \_\_\_\_\_\_\_\_\_ Commission. | | CO1 | U | | 1 |
| 5. | Identify part Part II 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 | An | | 1 |
| 7. | 6 sigma has \_\_\_\_\_\_\_\_\_ number of standard deviations on each side of a targeted mean. | | CO4 | R | | 1 |
| 8. | Calculate the value of 23Gy in terms of rad. | | CO4 | Ap | | 1 |
| 9. | Food Safety and Quality Systems were generally based on \_\_\_\_\_\_\_\_\_ product testing. | | CO6 | U | | 1 |
| 10. | IS \_\_\_\_\_\_\_\_\_ is the BIS standard for packaged drinking water. | | CO2 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State any 3 reason for removal of any member of FSSAI from his office without reasonable opportunity of being heard in the matter. | | CO1 | | R | 3 |
| 12. | Point out the imprisonment term and fine levied by AGMARK for counterfeiting grade designation mark and un-authorized marking with grade designation mark. | | CO5 | | An | 3 |
| 13. | List the ionizing radiations approved by the joint FAO/IAEA/WHO Study Group on irradiation of 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 | | An | 3 |
| 16. | Enumerate the unit operations in a typical manufacturing process for packaged drinking water as given by BIS. | | 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. | Point out the format followed while designing commodity standards as set out in the Procedural Manual of the Codex Alimentarius Commission. | CO1 | | An | 8 |
|  | b. | Recall the mandate of World Trade Organization. | CO1 | | R | 4 |
| 18. | a. | Summarize the licensing and registration process to be followed by a food business operator w.r.t FSSA, 2006. | CO2 | | U | 6 |
|  | b. | Explain the roles and responsibilities of Food safety Officer? | CO2 | | An | 6 |
| 19. | a. | Express the functions and responsibilities of WHA. | CO1 | | U | 6 |
|  | b. | Summarize the sanitary & phytosanitary agreements and technical barriers to trade agreements as under WTO. | CO4 | | Ev | 6 |
| 20. | a. | Describe the principles of HAACP and how HACCP functions in practice. | CO6 | | U | 8 |
|  | b. | Distinguish the functions of Scientific Panel and Scientific Committees of the Food Safety Standards Authority of India. | CO1 | | An | 4 |
| 21. | a. | Paraphrase the manufacturer’s needs that have to be taken into account developing labels for food products. | CO2 | | U | 6 |
|  | b. | Summarize the 7 principles of HACCP with examples of implementations. | CO6 | | R | 6 |
| 22. | a. | Summarize the functions and Responsibilities of ICGFI. | CO1 | | Ev | 6 |
|  | b. | Criticize the DMAIC methodology of 6σ. | CO5 | | Ev | 6 |
| 23. |  | Use the decision tree method to distinguish between CPs and CCPs in the following process. | CO6 | | Ap | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Discuss microbial, disinfection, chemical, radiological and acceptability aspects for quality of Drinking Water as per WHO. | CO5 | | U | 6 |
|  | b. | Breakdown the requirements of the Code of Federal Regulations for bottled drinking water. | CO4 | | An | 6 |

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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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 7 |  | 13 | 6 |  | **34** |
| CO2 | 7 | 12 |  | 6 |  |  | **25** |
| CO3 | 2 |  |  | 1 |  |  | **3** |
| CO4 | 4 | 7 |  |  | 6 |  | **17** |
| CO5 |  | 6 |  | 3 | 6 |  | **15** |
| CO6 | 6 | 9 | 12 | 3 |  |  | **30** |
|  | | | | | | | **124** |

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| **Course Code** | **18FP2018** | **Duration** | **3hrs** |
| **Course Name** | **MECHANICAL SYSTEMS FOR FOOD PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | \_\_\_\_\_\_\_\_ is a mechanical device designed to move a fluid b means of the transfer of rotational energy from one or more driven rotors. | | CO1 | U | | 1 |
| 2. | Head developed by centrifugal pump depends on \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ . | | CO1 | U | | 1 |
| 3. | Define velocity ratio. | | CO2 | R | | 1 |
| 4. | Write dimensions for torque. | | CO2 | R | | 1 |
| 5. | Babcock and Wilcox boilers are example for \_\_\_\_\_\_\_ boilers. | | CO3 | U | | 1 |
| 6. | Cochran boiler is example for \_\_\_\_\_\_\_\_\_ boiler. | | CO3 | R | | 1 |
| 7. | In refrigeration system heat is transferd from higher temperature region to lower temperaure region. State true or false. | | CO4 | U | | 1 |
| 8. | \_\_\_\_\_\_ model is one of the earliest models developed for calculating the freezing time. | | CO4 | R | | 1 |
| 9. | Conveying materials in pneumatic conveyor based on \_\_\_\_\_\_\_\_\_ property of material. | | CO5 | U | | 1 |
| 10. | The efficiency of belt conveyor is depends on \_\_\_\_\_\_\_\_\_\_. | | CO5 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Discuss working principle of rotary gear pump. | | CO1 | | U | 3 |
| 12. | Relation between torque, power and speed. | | CO2 | | U | 3 |
| 13. | Explain about water level indicator used in boiler. | | CO3 | | An | 3 |
| 14. | Explain about surface contact freezing. | | CO4 | | U | 3 |
| 15. | Describe the belt conveyor and its characteristics. | | CO5 | | U | 3 |
| 16. | The diameter of discharge wheel of a bucket elevator is 150 mm and the projection of the bucket is 114 mm. for optimum centrifugal discharge of material, calculate the rpm of operation of the elevator. | | CO6 | | 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 working principle of centrifugal pump. | CO1 | | An | 6 |
|  | b. | Write the application of reciprocator pump and centrifugal pump in food industry. | CO1 | | Ap | 6 |
| 18. | a. | Explain types of coupling with neat diagram. | CO2 | | U | 6 |
|  | b. | List the advantages and disadvantages of belt drive and chain drive. | CO2 | | U | 6 |
| 19. | a. | Comparison between water tube boilers and fire tube boilers. | CO3 | | U | 8 |
|  | b. | List the characteristics / essentials of a good boiler. | CO3 | | U | 4 |
| 20. | a. | Illustrate the compression refrigeration system with the help of a suitable diagram. | CO4 | | An | 9 |
|  | b. | List the type of chillers used for solid foods. | CO4 | | U | 3 |
| 21. | a. | Explain the design criterion for a belt conveyor. | CO5 | | An | 8 |
|  | b. | Write the points to be kept in mind while selecting the conveyor. | CO5 | | U | 4 |
| 22. | a. | Explain about screw conveyor with neat sketch. | CO6 | | U | 6 |
|  | b. | A screw conveyor mounted on a 4 cm diameter shaft has screw pitch and diameter both equal to 30 cm. estimate its actual capacity of conveying wheat weighing 850 kg/cm3 while operating at 150 rpm. Assume actual capacity as 50% of theoretical capacity. Also, determine the horse power requirement of motor for a screw length of 8 m, if the horse power material factor for wheat is 0.4. | CO6 | | E | 6 |
| 23. |  | A bucket elevator for lifting paddy, each bucket is 25 mm long and a cross section which is a section of circle having a radius of 15 cm and subtending an angle of 81o at the center. The buckets are spaced 45 cm apart and the lift is 25 m and head wheel diameter of 60 cm. Calculate (a) belt speed so that the discharge be centrifugal, (b) capacity of lifting paddy that weighs 580 kg/m3, and (c) horse power required, assuming an overall efficiency is 85%. | CO6 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Derive an expression for estimating the speed of the head pulley of bucket elevator. | CO6 | | An | 6 |
|  | b. | Explain the pneumatic conveying system with its limitations. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the working principle of pumps and their applications. |
| CO2 | Know about the various power transmission elements and their design. |
| CO3 | Gain knowledge on working principle of boilers and measurement of performance. |
| CO4 | Study the working principle and applications of various mechanical refrigeration systems. |
| CO5 | Learn about the principles and applications of different food chillers and freezers. |
| CO6 | Appraise the construction and working principle of various material handling systems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 5 | 6 | 6 | - | - | 17 |
| CO2 | 2 | 15 | - | - | - | - | 17 |
| CO3 | 1 | 13 | - | 3 | - | - | 17 |
| CO4 | 1 | 7 | - | 9 | - | - | 17 |
| CO5 | - | 9 | - | 8 | - | - | 17 |
| CO6 | - | 12 | - | 6 | 21 | - | 39 |
|  | | | | | | | **124** |

**Graphical user interface, application

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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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define parboiling. | | CO1 | R | | 1 |
| 2. | List the advantages of LSU dryer. | | CO1 | An | | 1 |
| 3. | Engleberg huller is banned in India. Why? | | CO2 | R | | 1 |
| 4. | Recall the formula to determine milling efficiency. | | CO2 | R | | 1 |
| 5. | Define Bulgar. | | CO3 | R | | 1 |
| 6. | Mention the uses of germ from wheat milling industries | | CO3 | R | | 1 |
| 7. | Write the composition of maize. | | CO4 | U | | 1 |
| 8. | Name the enzymes used in starch hydrolysis | | CO4 | R | | 1 |
| 9. | Differentiate wet and dry milled pulses. | | CO5 | Ap | | 1 |
| 10. | List the pulse flour based products. | | CO6 | An | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Discuss the changes in the cooking quality of rice after parboiling. | | CO1 | | E | 3 |
| 12. | Draw the flow chart for quick cooking rice. | | CO2 | | Ap | 3 |
| 13. | Explain the principles of wheat parboiling. | | CO3 | | An | 3 |
| 14. | Tabulate the products of corn wet milling. | | CO4 | | U | 3 |
| 15. | Distinguish acid and enzyme hydrolysis process of starch | | CO5 | | An | 3 |
| 16. | Interpret the reason for conditioning pulses before milling. | | 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. | Identify the different parboiling methods and interpret them. | CO1 | | U | 8 |
|  | b. | Draw the flow chart for the manufacture of puffed rice. | CO1 | | Ap | 4 |
|  |  |  |  | |  |  |
| 18. |  | Describe the rice bran oil extraction and refining process. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Demonstrate wheat flour milling process. | CO3 | | U | 8 |
|  | b. | Examine the bulgar production process using lye peeling method. | CO3 | | An | 4 |
|  |  |  |  | |  |  |
| 20. |  | Discuss the Corn wet milling process with a neat flow chart. | CO4 | | C | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Construct the flowchart for traditional method of tortilla production. | CO5 | | A | 7 |
|  | b. | Interpret the Super Critical Fluid Extraction of corn oil. | CO5 | | E | 5 |
|  |  |  |  | |  |  |
| 22. |  | Explain the construction and working of LSU and Rotary dryers with a neat sketch | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Outline the HFCS production process. | CO5 | | U | 6 |
|  | b. | Analyze the steps involved in Pasta and noodle manufacturing. | CO3 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Elaborate the commercial methods of pulse milling. | CO6 | | C | 12 |

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|  | **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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 8 | 16 | 1 | 3 |  | 29 |
| CO2 | 2 | 12 | 3 |  |  |  | 17 |
| CO3 | 2 | 8 |  | 6 |  |  | 16 |
| CO4 | 1 | 5 |  |  |  | 12 | 18 |
| CO5 |  | 6 | 8 | 3 | 5 |  | 22 |
| CO6 |  | 3 |  | 1 |  | 18 | 22 |
|  | | | | | | | **124** |

**Graphical user interface, application

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Explain “pol”. | | CO2 | U | | 1 |
| 2. | Mr Hemanth wants clarity on “Molasses”. Can you explain him about the same? | | CO4 | A | | 1 |
| 3. | Determine the alcohol content of a spirit of 60° Proof. | | CO2 | A | | 1 |
| 4. | Expand – ICUMSA. | | CO1 | R | | 1 |
| 5. | Judge the purpose of fat in breads. | | CO3 | E | | 1 |
| 6. | Express your view on measurement of fiber index in cane processing. | | CO5 | C | | 1 |
| 7. | Illustrate the use of Boerner Divider in wheat quality. | | CO4 | An | | 1 |
| 8. | Indicate the application Hagberg Falling Number test in wheat flour quality testing. | | CO5 | U | | 1 |
| 9. | Illustrate the use of “hop” in beer making process. | | CO1 | An | | 1 |
| 10. | Recall the role of salt in toffee making. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the process of chaptalisation. | | CO3 | | U | 3 |
| 12. | Mr Kumar wants clarity on “Massecuite”. Can you explain him about the same? | | CO4 | | A | 3 |
| 13. | Explain the process of *remontage.* | | CO3 | | U | 3 |
| 14. | List the enzymes needed to get a soft bread and justify. | | CO6 | | An | 3 |
| 15. | Mr. Tejus. wants your consultation on the manufacture of High fiber 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 |
| 16. | Summarize the contribution of fat in the manufacture of a good quality toffee. | | 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. |  | Summarize the process of sugar manufacturing with process flow chart. | CO5 | | E | 12 |
| 18. |  | Rewrite the process of barley malting in beer making. | CO6 | | C | 12 |
| 19. |  | State the faults in bread making. | CO2 | | R | 12 |
| 20. |  | Describe the various unit operations involved in jaggery manufacturing with process flowchart. | CO3 | | R | 12 |
| 21. |  | Explain how the farinograph is useful to determine the quality of flours and what are the parameters can be measured using farinogram. | CO4 | | An | 12 |
| 22. | a. | Outline the process of defecation of sugar syrup. Summarise the reasons for the same. | CO5 | | A | 8 |
|  | b. | Can you also suggest a suitable crystalliser for a crystal sugar manufacture and give its working principle? | CO1 | | A | 4 |
| 23. | a. | Outline the steps involved in the manufacture of toffees. | CO5 | | U | 6 |
|  | b. | Briefly discuss the machineries involved in the manufacture of toffees. | CO1 | | 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 |

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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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 6 | 4 | 1 |  |  | 12 |
| CO2 | 12 | 4 | 1 |  |  |  | 17 |
| CO3 | 12 | 13 | 5 | 3 | 1 |  | 34 |
| CO4 |  |  | 4 | 13 |  |  | 17 |
| CO5 |  | 7 | 8 |  | 12 | 1 | 28 |
| CO6 | 1 |  |  | 3 |  | 12 | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **18FP2024/17FP2024** | **Duration** | **3hrs** |
| **Course Name** | **ENGINEERING PROPERTIES OF FOOD MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define porosity. | | CO1 | R | | 1 |
| 2. | Relate the effect of moisture content on angle of repose. | | CO1 | U | | 1 |
| 3. | Recite the equation for Non-Newtonian fluid. | | CO2 | R | | 1 |
| 4. | Interpret Bingham plastic fluids. | | CO2 | R | | 1 |
| 5. | Differentiate sensible and latent heat. | | CO3 | U | | 1 |
| 6. | Deduce an expression for thermal diffusivity. | | CO3 | R | | 1 |
| 7. | Recite the equation of terminal velocity. | | CO4 | R | | 1 |
| 8. | Relate the air velocity of grains with their terminal velocity for deigning conveying equipment. | | CO4 | U | | 1 |
| 9. | Paraphrase Equilibrium moisture content. | | CO5 | R | | 1 |
| 10. | Recall the Henderson equation for equilibrium moisture determination. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare roundness and sphericity. | | CO1 | | An | 3 |
| 12. | Examine the working principle of capillary flow viscometer. | | CO2 | | A | 3 |
| 13. | Define enthalpy and give an expression for moist material. | | CO3 | | An | 3 |
| 14. | Illustrate the forces acting on a body immersed in a fluid current. | | CO4 | | U | 3 |
| 15. | State the sorption theory and Hysteresis effect. | | CO5 | | An | 3 |
| 16. | Interpret the working principle of microwave heating. | | 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. | Discuss the determination of volume of solid samples using pycnometer and platform scale methods. | CO1 | | An | 8 |
|  | b. | Explain the method of measurement of angle of repose for food materials. | CO1 | | A | 4 |
| 18. | a. | Discuss briefly about the Texture Profile Analysis with a neat sketch. | CO5 | | A | 8 |
|  | b. | Outline the classification of rheology and distinguish between pseudoplastic and dilatant fluid with examples. | CO2 | | An | 4 |
| 19. | a. | Appraise the Differential Scanning Calorimeter (DSC) method for measuring thermal conductivity of foods. | CO6 | | An | 6 |
|  | b. | Elaborate on the method of mixtures for the measurement of specific heat. | CO1 | | A | 6 |
| 20. | a. | Derive the expression for terminal velocity. | CO3 | | An | 8 |
|  | b. | Discuss the applications of aerodynamic properties. | CO3 | | A | 4 |
| 21. | a. | Analyze the sorption-isotherm curve. | CO4 | | An | 6 |
|  | b. | Calculate the equilibrium moisture content of brinjal seed at relative humidity of 10 % and temperature of 50oC using Henderson’s equation. Given that constants c is 6.5 x 10-6 and n is 1.8. | CO4 | | E | 6 |
| 22. | a. | Discuss the various steady state methods of thermal conductivity measurement. | CO6 | | E | 8 |
|  | b. | Bulk density of material is given as 600 kg/m3 and true density as 1000 kg/m3. Calculate the porosity. | CO1 | | An | 4 |
| 23. | a. | Explain the capillary flow viscometer for measuring viscosity. | CO5 | | A | 6 |
|  | b. | Explain transient hot wire method for measuring thermal conductivity. | CO6 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Outline the measurement of dielectric properties of food materials. | CO6 | | U | 8 |
|  | b. | Examine the effect of dielectric properties on the following:  (i) Moisture content (ii) Temperature | CO6 | | An | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand Engineering properties of food materials. |
| CO2 | Identify the structure and chemical composition of foods. |
| CO3 | Determine the physical properties of food materials. |
| CO4 | Calculate the water activity, food stability sorption and desorption isotherm of food materials. |
| CO5 | Study the difference between Newtonian and non-Newtonian fluids. |
| CO6 | Examine the thermal properties, electrical and magnetic properties of food |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 10 | 15 | - | - | 27 |
| CO2 | 2 | - | 3 | 4 | - | - | 9 |
| CO3 | 1 | 1 | 4 | 11 | - | - | 17 |
| CO4 | 1 | 4 | - | 6 | 6 | - | 17 |
| CO5 | 1 | - | 14 | 3 | - | - | 18 |
| CO6 | - | 9 | 3 | 16 | 8 | - | 36 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Write the application of Ni in steel. | | CO1 | U | | 1 |
| 2. | Deduce an equation for compressive stress. | | CO1 | R | | 1 |
| 3. | Name the support type for large horizontal pressure vessel. | | CO2 | R | | 1 |
| 4. | Application of conical head in pressure vessel. | | CO2 | R | | 1 |
| 5. | The rated capacity of reaction vessels normally varies between 100 litres to as large as 1500 litres, with the shell diameter varying between 50 cm and 250 cm. Suggest the types of heads used for such vessels. | | CO3 | U | | 1 |
| 6. | Explain the consequence, if the vessel is considered as reaction kettle. | | CO3 | R | | 1 |
| 7. | List the parameters considered for classification of heat exchanger. | | CO4 | U | | 1 |
| 8. | The first fluid flows inside a pipe, while a second fluid flows either co-or-counter currently in the annul space between a large pipe and the outside of the inner pipe carrying the first fluid. This is example for \_\_\_\_\_\_ heat exchanger. | | CO4 | R | | 1 |
| 9. | Evaporators are used for \_\_\_\_\_\_\_\_\_ liquids. | | CO5 | U | | 1 |
| 10. | Suggest the suitable agitator for higher discharge velocity. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the factors that enhance corrosion of equipment. | | CO1 | | An | 3 |
| 12. | A thin cylinder is subjected to internal pressure of 10 MPa, internal cylinder diameter is 1000 mm. if allowable stress is 100 MPa than determine wall thickness. | | CO2 | | E | 3 |
| 13. | Explain types of joints used for design of storage vessels. | | CO3 | | An | 3 |
| 14. | List the parameters which influence the rate of heat transfer in reaction vessel. | | CO4 | | U | 3 |
| 15. | Discuss the design and working of fin type heat exchanger. | | CO5 | | An | 3 |
| 16. | Discuss helical screw agitator with neat sketch. | | 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. | Explain stress – strain curve for steel. | CO1 | | An | 4 |
|  | b. | Analyze the stress developed in thick pressure vessel. | CO1 | | An | 8 |
| 18. | a. | Classify food processing equipment. | CO2 | | R | 6 |
|  | b. | Explain the types of corrosion of food processing equipment. | CO2 | | A | 6 |
| 19. | a. | Explain bracket or lug type support. | CO3 | | A | 2 |
|  | b. | A thick cylinder has 200 mm inner diameter and 300 mm outer diameter. The internal pressure is 20MPa and external pressure is 5MPa. 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 without stiffeners and Top-edge stiffeners for storing liquids. | CO4 | | An | 6 |
|  | b. | Summarize the types of floating roofs for variable volume tank. | CO4 | | R | 6 |
| 21. | a. | Design the tube for shell and tube heat exchangers. | CO5 | | C | 6 |
|  | b. | Discuss the theory and practice of shell and tube heat exchangers with neat diagram. | CO5 | | U | 6 |
| 22. | a. | Explain double pipe heat exchangers with neat diagram. | CO5 | | An | 8 |
|  | b. | Discuss special type of heat exchangers. | CO5 | | U | 4 |
| 23. |  | Briefly explain calendria type evaporator with neat sketch. | CO6 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Classify the agitators and explain about paddle agitator with neat sketch. | CO6 | | An | 12 |

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|  | **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 | 9 | 1 | 6 | - | 3 | - | 17 |
| CO3 | 1 | 1 | 2 | 3 | 10 | - | 17 |
| CO4 | 7 | 4 | - | 6 | - | - | 17 |
| CO5 | - | 11 | - | 11 | - | 6 | 28 |
| CO6 | - | 4 | - | 24 | - | - | 28 |
|  | | | | | | | **124** |

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define the term “food additives”, | | CO1 | U | | 1 |
| 2. | State the full form of NOAEL and BMD. | | CO6 | U | | 1 |
| 3. | Define the term ADI. | | CO1 | R | | 1 |
| 4. | Recollect other name by which dough conditioners are known. | | CO5 | R | | 1 |
| 5. | State the definition of preservative according to FSSAI. | | CO1 | R | | 1 |
| 6. | Define the term Glycemic index. | | CO3 | U | | 1 |
| 7. | Humectants are hygroscopic in nature – Justify the statement. | | CO5 | E | | 1 |
| 8. | List the artificial sweeteners approved by FDA, | | CO5 | A | | 1 |
| 9. | Recall the pigment from animal and insect sources. | | CO4 | R | | 1 |
| 10. | List out the types of Flavourants based on its origin and nature of raw materials. | | CO3 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write a short note on E numbers. | | CO1 | | C | 3 |
| 12. | List the applications of Nisin and Lysozyme. | | CO2 | | R | 3 |
| 13. | Appraise the functions and purpose of adding flavorants in foods. | | CO6 | | E | 3 |
| 14. | Summarize the role of nutritional food additives. | | CO2 | | E | 3 |
| 15. | List atleast 5 functional classes of additives. | | CO6 | | R | 3 |
| 16. | Appraise the functions and disadvantages of maturing agents. | | 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. |  | Classify the food additives based on functions with suitable examples. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Distinguish fat replacers and fat substitutes (mimetics). Add a note on starch based and protein - based replacers with relevant examples. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Classify the types of acidulants. Mention the chemical properties of acidulants. | CO2 | | R | 12 |
|  |  |  |  | |  |  |
| 20. |  | Articulate the functions of flavorants in food. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Discuss the role of dough conditioners in foods with a special mention on applications in bakery products. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Compare natural and Synthetic antioxidants. Outline the mechanism of any three synthetic antioxidants. | CO3 | | R | 12 |
|  |  |  |  | |  |  |
| 23. |  | Elaborate the source, role and mechanism of action of natural colorants in foods (Any four). | CO3 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Write a short note on anti-browning agents. | CO6 | | C | 12 |

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

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 13 | - | - | - | 3 | 18 |
| CO2 | 15 | - | - | - | 3 | - | 18 |
| CO3 | 12 | 1 | 13 | - | 12 | - | 38 |
| CO4 | 1 | 12 | - | - | - | - | 13 |
| CO5 | 1 | 12 | 1 | - | 1 | - | 15 |
| CO6 | 3 | 1 | - | 3 | 3 | 12 | 22 |
|  | | | | | | | **124** |

**Graphical user interface, application

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

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | \_\_\_\_\_\_\_\_ is the ideal moisture content ready to be packed for coffee beans. | CO1/U | 1 |
| 2. | Company “Bresque café” claims that its Coffee is really expensive because they only choose the best coffee beans. The reason is \_\_\_\_\_\_\_\_\_\_\_. | CO1/U | 1 |
| 3. | \_\_\_\_\_\_\_\_ of tea leaves is done for Black tea manufacture such that the enzymes in the leaves come out and start to oxidize. | CO2/A | 1 |
| 4. | Oolong Tea is \_\_\_\_\_ | CO2/A | 1 |
| 5. | The process of tasting the coffee/ cocoa is \_\_\_\_\_\_\_\_\_\_ | CO3/U | 1 |
| 6. | \_\_\_\_\_\_ is the fermentation time for cocoa beans. | CO3/U | 1 |
| 7. | The king of spices is \_\_\_\_\_\_\_\_\_. | CO4/A | 1 |
| 8. | \_\_\_\_\_\_\_\_\_\_\_\_ is preserved by dipping the harvested capsules in baking soda for 10 minutes (with minimum moisture content), spreading them and keeping them in gunny bags lined with polythene. | CO4/A | 1 |
| 9. | Chillies are pungent due to the presence of the compound \_\_\_\_\_. | CO5/An | 1 |
| 10. | \_\_\_\_ are the concentrated liquid part of spices. They are obtained by solvent extraction of the dry spices and represent the characteristic aroma of the spices. | CO5/An | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Generalize the occurrence and harvesting of coffee bean. | CO1/U | 3 |
| 12. | Relate the correlation between the quality and health benefits of CTC tea with and without the milk supplement. | CO2/A | 3 |
| 13. | Describe the cocoa bean composition. | CO3/U | 3 |
| 14. | Discuss the synthesis of flavor identical compounds. | CO4/A | 3 |
| 15. | Contrast the benefits of pepper and chilli. | CO5/An | 3 |
| 16. | Write down the significance of areca nut. | CO6/U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Demonstrate the process flow sheet for the manufacturing of coffee powder with insights on fermentation of coffee bean in detail. | CO1/U | 8 |
| b. | State the technology for instant coffee technology and grading of the coffee. | CO1/U | 4 |
|  |  |  |  |  |
| 18. | a. | Deduce the occurrence, chemical constituents and manufacturing practice for the (i) Oolong and (ii) green tea. | CO2/A | 8 |
| b. | Implement the strategy for the grading of tea powder. | CO2/A | 4 |
|  |  |  |  |  |
| 19. | a. | Expound the types, chemistry and manufacturing process for chocolates. Add short notes on the quality control parameters in detail. | CO3/U | 12 |
|  |  |  |  |  |
| 20. | a. | Execute the general methods of manufacturing and quality aspects of oleoresins and essential oils. | CO4/A | 12 |
|  |  |  |  |  |
| 21. | a. | Analyze the chemistry of volatiles and the methods of manufacturing for the ginger, chilli and mint processing. | CO5/An | 8 |
| b. | Elucidate the quality control steps for major spices in detail. | CO5/An | 4 |
|  |  |  |  |  |
| 22. | a. | Appraise the theory behind the chemistry and fermentation process of cocoa beans in detail. | CO3/U | 8 |
| b. | Give a detailed account on the health benefits of oleoresins. | CO3/U | 4 |
|  |  |  |  |  |
| 23. | a. | Expound the application, quality control and technology involved with storage of following major spices:   1. Cardamom (ii) Pepper (iii) Turmeric | CO5/A | 12 |
|  |  | **Compulsory:** | | |
| 24. | a. | Explicate the chemistry, quality control and technology involved with the following minor spices:   1. Clove (ii) Fenugreek (iii) Cumin | CO6/U | 12 |

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|  | **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 Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 17 | - | - | - | - | 17 |
| CO2 | - | - | 17 | - | - | - | 17 |
| CO3 | - | 29 | - | - | - | - | 29 |
| CO4 | - | - | 17 | - | - | - | 17 |
| CO5 | - | - | 12 | 17 | - | - | 29 |
| CO6 | - | 15 | - | - | - | - | 15 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Write the amount of myoglobin present in pork. | | CO1 | C | 1 |
| 2. | Cite the fungus responsible for white spots in meat. | | CO1 | U | 1 |
| 3. | Point out the percentage of Albumen in egg. | | CO5 | An | 1 |
| 4. | Define stunning process. | | CO2 | R | 1 |
| 5. | Comment on “Freezer burn in meat”. | | CO3 | U | 1 |
| 6. | Identify the amount of nitrite that has to be present in final cured meat. | | CO3 | R | 1 |
| 7. | Define tumbling process. | | CO2 | R | 1 |
| 8. | Identify the protein responsible for jelly like character of egg white. | | CO5 | R | 1 |
| 9. | Point out the percentage of protein in fish. | | CO6 | An | 1 |
| 10. | Recall the type of freezer used for small shrimp. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Draw and label the structure of muscles. | | CO1 | C | 3 |
| 12. | Recall any three features of modern abattoir. | | CO4 | R | 3 |
| 13. | Comment on “Salt as curing agent”. | | CO3 | U | 3 |
| 14. | Draw and label the structure of egg. | | CO5 | C | 3 |
| 15. | Point out the objectives of ante-mortem inspection. | | CO2 | An | 3 |
| 16. | Write a short note on Nutritive value of raw fish. | | CO6 | 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. |  | Summarize post mortem changes in muscles after the slaughtering. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the different methods of meat tenderization. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Illustrate HACCP plan in meat industry. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize the packaging techniques in poultry. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Describe the Stunning methods. | CO2 | R | 12 |
|  |  |  |  |  |  |
| 22. |  | Describe the muscle composition and its modifiers. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the steps involved in production of Canned meat. | CO3 | U | 6 |
|  | b. | Describe the Sausage production process. | CO3 | R | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Write short notes on method and ice types used in icing of fish. | CO6 | C | 12 |

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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. |
| 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 / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 12 | 13 | - | - | - | 4 | 29 |
| CO2 | 14 | - | - | 15 | - | - | 29 |
| CO3 | 7 | 10 | - | - | - | - | 17 |
| CO4 | 3 | 12 | - | - | - | - | 15 |
| CO5 | 1 | 12 | - | 1 | - | 3 | 17 |
| CO6 | 1 | - | - | 1 | - | 15 | 17 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | “I” in PIECES stands for \_\_\_\_\_\_\_. | | CO1 | U | | 1 |
| 2. | Under capitalization refers to \_\_\_\_\_\_\_\_\_\_. | | CO1 | R | | 1 |
| 3. | EHEDG stands for \_\_\_\_\_\_\_\_. | | CO2 | R | | 1 |
| 4. | The difference between SS 316 and SS 304 is \_\_\_\_\_\_\_\_. | | CO3 | R | | 1 |
| 5. | Expand ORP. | | CO2 | R | | 1 |
| 6. | OSHA refers to \_\_\_\_\_\_\_\_\_\_\_. | | CO5 | R | | 1 |
| 7. | CEPCI stands for \_\_\_\_\_\_\_\_\_\_. | | CO6 | R | | 1 |
| 8. | Capital cost is the sum of \_\_\_\_\_\_\_\_\_\_\_. | | CO5 | R | | 1 |
| 9. | ROI refers to \_\_\_\_\_\_\_\_\_\_\_\_. | | CO5 | R | | 1 |
| 10. | Amortization refers to \_\_\_\_\_\_\_\_\_\_. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Mr. X wants to know the amount (in kg) of grapes required for preparing 100 kg of squash. Can you help him? | | CO1 | | An | 3 |
| 12. | Briefly outline the importance of deciding the scope of a project. | | CO6 | | U | 3 |
| 13. | Mr. Y wants to set up a wheat milling unit. Can you suggest a suitable choice of place based on your understanding? | | CO3 | | An | 3 |
| 14. | Differentiate the 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 2010). 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. Fruitwala, a startup venture analyst, observes that a similar venture of XX has yielded 20 crores of total returns in 6 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 technical feasibility of a project. | 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 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 PRPs for a mixed fruit 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 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. |  | 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. |  | Mr. YY wants to know the contribution of the following in deciding the product cost. Can you help him? –   1. Depreciable assets. (b) Raw material cost. 2. 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. Discounted cash flow. (b) Net present worth. | CO6 | | A | 2x4 = 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 |  |  | 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** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Name the force responsible for the formation of water molecule. | CO1 | R | 1 |
| 2. | Name any two-point defects occurring in solid. | CO3 | R | 1 |
| 3. | Define strain. | CO2 | R | 1 |
| 4. | Define ductility. | CO2 | R | 1 |
| 5. | Give one example for ductile fracture. | CO2 | U | 1 |
| 6. | Classify two types of fracture occurring in metals. | CO2 | U | 1 |
| 7. | Classify types of corrosion on the basis of working Environment. | CO4 | U | 1 |
| 8. | Write a balanced reaction occurring at cathode during corrosion of Iron. | CO1 | An | 1 |
| 9. | Define carbon steel. | CO4 | R | 1 |
| 10. | Define stainless steel. | CO4 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Write a short note on Vander Waals Bonding. | CO1 | U | 3 |
| 12. | Classify types of deformation. | CO2 | U | 3 |
| 13. | List the factors affecting fracture of material. | CO2 | An | 3 |
| 14. | Explain degradation. | CO5 | U | 3 |
| 15. | List mechanical properties of normalized carbon steel. | CO4 | U | 3 |
| 16. | List different techniques for particle size analysis. | CO6 | U | 3 |

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| **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 amorphous and crystalline solids. | CO1 | An | 6 |
| b. | Enlist four important bonding types occurring in atoms and explain metallic bonding in detail. | CO1 | An | 6 |
| 18. |  | Explain a stress strain relation for a material subjected to tensile stress by using stress strain curve. | CO2 | An | 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. | Summarize the phases involved in the quenching process. | CO4 | U | 6 |
| b. | Enlist the applications of carbon steel and stainless steel. | CO4 | A | 6 |
| 22. | a. | Explain Fracture toughness. | CO2 | R | 6 |
| b. | Explain mechanism of Fatigue Failure. | CO2 | U | 6 |
| 23. |  | Explain in detail the steps occurring in ductile facture with diagrams. | CO2 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Write in detail explaining mechanism of XRD and its applications. | CO6 | U | 12 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | - | 13 | - | - | 17 |
| CO2 | 8 | 17 | - | 15 | - | 18 | 58 |
| CO3 | 1 | - | - | - | - | - | 1 |
| CO4 | 2 | 10 | 6 | - | - | - | 18 |
| CO5 | - | 9 | - | - | - | - | 9 |
| CO6 | - | 15 | 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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the scientist who has introduced pasteurization. | | CO1 | R | | 1 |
| 2. | Recall the taxonomy that is used to determine the genus and species of a new prokaryote. | | CO1 | R | | 1 |
| 3. | Identify the complete viral particle. | | CO2 | U | | 1 |
| 4. | Identify the endotoxin found in Gram negative bacteria. | | CO2 | U | | 1 |
| 5. | Locate the polysaccharide found in cell walls of fungi | | CO3 | R | | 1 |
| 6. | Predict the storage product of red algae. | | CO3 | U | | 1 |
| 7. | Name the macronutrient that is required for the heat stability of endospores. | | CO4 | R | | 1 |
| 8. | Give an example for enriched media. | | CO4 | U | | 1 |
| 9. | Name the counting chamber that is used to enumerate prokaryotes | | CO5 | R | | 1 |
| 10. | Cite an example of capsulated bacteria. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State the concept of biogenesis theory. | | CO1 | | R | 3 |
| 12. | Define prophage with an example. | | CO2 | | R | 3 |
| 13. | Record any two economic importance of fungi | | CO3 | | A | 3 |
| 14. | Define thermophile with a suitable example. | | CO4 | | R | 3 |
| 15. | Differentiate pour plate and spread plate technique | | CO5 | | An | 3 |
| 16. | Define moist heat sterilization. | | 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. |  | Write any three molecular techniques that are used to determine the microbial taxonomy. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Differentiate lytic and lysogenic cycle of bacteriophage. Elaborate on the lytic cycle of Bacteriophage with a neat diagrammatic representation. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Discuss the methods of sexual reproduction and the spores produced by fungi in detail. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Criticize the factors affecting the growth of bacteria in detail. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Determine the pure culture techniques that are used to enumerate the bacterial growth. | CO5 | | A | 8 |
|  | b. | Write the principle of Gram staining. | CO5 | | A | 4 |
|  |  |  |  | |  |  |
| 22. |  | With a neat sketch, explain the working principle of transmission electron microscope. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 23. |  | Categorize nutritional requirements of bacteria for their growth. | CO4 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Define Sterilization. Summarize the physical method of sterilization that controls the growth of bacteria. | CO6 | | E | 12 |

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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 growth of bacteria. |
| CO5 | Recommend the methods used for enumeration, identification and preservation of bacteria. |
| CO6 | Create sterilization protocol for the control of microorganism. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 12 | - | - | - | - | 17 |
| CO2 | 3 | 14 | - | - | - | - | 17 |
| CO3 | 1 | 13 | 3 | - | - | - | 17 |
| CO4 | 4 | 1 | - | 24 | - | - | 29 |
| CO5 | 1 | - | 12 | 15 | - | - | 28 |
| CO6 | 3 | 1 | - | - | 12 | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define the metric system of measurement. | | CO1 | R | | 1 |
| 2. | Express the moisture content in wet and dry basis. | | CO1 | U | | 1 |
| 3. | Write the equation for real gases. | | CO2 | R | | 1 |
| 4. | State Avogadro’s law. | | CO2 | R | | 1 |
| 5. | Give an example for tie material. | | CO3 | R | | 1 |
| 6. | Recite the general expression for material balance with or without chemical reactions. | | CO3 | R | | 1 |
| 7. | State Kopp’s rule. | | CO4 | R | | 1 |
| 8. | Differentiate potential and kinetic energy. | | CO4 | U | | 1 |
| 9. | Recall NHV and GHV. | | CO5 | R | | 1 |
| 10. | Define dew point temperature. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Distinguish between base and derived units with examples. | | CO1 | | U | 3 |
| 12. | Derive an equation for density of gases using ideal gas equation. | | CO2 | | An | 3 |
| 13. | 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. | | CO3 | | A | 3 |
| 14. | Interpret the term heat capacity of a system and recite the heat capacity as a quadratic function of temperature. | | CO4 | | U | 3 |
| 15. | Calculate the standard heat of reaction for the following reaction:  C2H6(g) C2H4(g) + H2(g)  Data  Component ∆Cº (KJ/mol)  C2H6  1561  C2H4 1411  H2 286 | | CO5 | | E | 3 |
| 16. | Define relative humidity. | | 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. | The solubility of sodium chloride in water at 290 K is 35.8 kg/100 kg of water. Express the solubility as the following:  i) Mass fraction and mass percent of NaCl.  ii) Mole fraction and mole percent of NaCl.  iii) kmol NaCl per 1000 kg of water. | CO1 | | E | 8 |
|  | b. | Criticize the moisture content in both dry and wet basis concept. | CO1 | | An | 4 |
|  |  |  |  | |  |  |
| 18. | a. | Illustrate the gas laws and derive an expression for ideal gas equation. | CO2 | | A | 8 |
|  | b. | Elaborate the Dalton’s law and Amagat’s Law with a neat diagram. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 19. | a. | A triple effect evaporator is used to concentrate 1000 kg of aqueous solution from a concentration of 20% solute to 80% solute. Assuming an equal amount of vaporization in each effect, calculate the composition and weight of the solution entering the second and third effects. | CO3 | | E | 6 |
|  | b. | Draw a diagram and set up equations representing total mass balance and component mass balance for a system involving the mixing of pork (15% protein, 20% fat, and 63% water) and backfat (15% water, 80% fat, and 3% protein) to make 100 kg of a mixture containing 25% fat. | CO3 | | An | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Discuss the heat capacities of solids, liquids and gases. | CO4 | | An | 6 |
|  | b. | Interpret the standard heat of reaction, combustion and formation with example. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Demonstrate the method of determination of composition by Orsat analysis. | CO5 | | A | 10 |
|  | b. | A rigid tank holds one kg of air at 300K. The air has an internal energy of 0.25 x 103 kJ with reference to the fixed datum conditions. Heat is added to the air until the internal energy is 0.35 x 103 kJ. Calculate the heat transferred to the air. | CO5 | | E | 2 |
|  |  |  |  | |  |  |
| 22. | a. | A crystallizer is charged with 100 kg of a solution containing 25% Ba(NO3)2 in water. On cooling 10% of the original water present evaporates. Calculate the yield of crystals when the solution is cooled to 283 K. The solubility at 283 K is 7.0 kg Ba(NO3)2 /100 kg total water. | CO3 | | E | 6 |
|  | b. | How much weight reduction would result when a material is dried from 80 % moisture to 50% moisture? | CO3 | | An | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Elaborate on the Hess’s Law of Constant Heat Summation. | CO4 | | U | 6 |
|  | b. | Summarize the kinetic theory of Gases. | CO2 | | E | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Atmospheric air at 760mm of Hg has 45ºC dry bulb temperature and 30 ºC wet bulb temperature. Solve the following using psychrometric chart. a)Relative humidity b)Humidity Ratio c)Dew Point Temperature d)Enthalpy e)Specific Volume of Air. | CO6 | | An | 12 |

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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 | 4 | - | 4 | 8 | - | 17 |
| CO2 | 2 | 4 | 8 | 3 | 6 | - | 23 |
| CO3 | 2 | - | 3 | 12 | 12 | - | 29 |
| CO4 | 1 | 10 | 6 | 6 | - | - | 23 |
| CO5 | 1 | - | 10 | - | - | 5 | 16 |
| CO6 | 1 | 3 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Mention the H-O-H angle in water. | | CO1 | R | | 1 |
| 2. | Give an example for water – in – oil food system. | | CO1 | R | | 1 |
| 3. | This disaccharide is also called as “milk sugar”. Can you name? | | CO1 | U | | 1 |
| 4. | When starch is treated with glucoamylase, you get the following product. Can you name it? | | CO1 | R | | 1 |
| 5. | An example for 18:1 fatty acid is \_\_\_\_\_\_\_\_. | | CO1 | R | | 1 |
| 6. | Expand DHA. | | CO1 | R | | 1 |
| 7. | Recall an example for an amino acid with a side chain -NH2 group. | | CO1 | R | | 1 |
| 8. | Recall the function of an invertase | | CO1 | R | | 1 |
| 9. | Tomato is rich in \_\_\_\_\_\_\_\_\_\_\_\_carotenoids. | | CO1 | U | | 1 |
| 10. | Oranges are rich in \_\_\_\_\_\_\_\_ vitamins. | | CO1 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the factors affecting water activity of a product. | | CO3 | | U | 3 |
| 12. | Sate the conditions under which an aldose is converted to an alduronic acid. | | CO2 | | U | 3 |
| 13. | Define Iodine value and pen down its significance. | | CO2 | | A | 3 |
| 14. | List the factors that stabilize the structure of proteins. | | CO4 | | U | 3 |
| 15. | Analyze the enzymes used for the following – a. Haze removal in beer. B. Haze removal in a fruit-based beverage. | | CO5 | | An | 3 |
| 16. | Illustrate on the oxidation reaction of Vitamin C. | | 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. | Discuss briefly on the structure of water and ice. | CO4 | | U | 6 |
|  | b. | Relate the term Hydration shell to the observed changes in an isotherm. | CO3 | | A | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Summarize the effects of (a)P Electrical double layer forces and (b) steric hindrance towards stabilizing an emulsion. | CO4 | | U | 6 |
|  | b. | Summarize the characteristic features of (a) Coalescence and (b) Sedimentation. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Summarize the method for the manufacture of High Fructose Corn Syrup. | CO3 | | A | 9 |
|  | b. | Illustrate the principle of Lane and Eynon’s method of estimation of reducing sugars. | CO2 | | A | 3 |
|  |  |  |  | |  |  |
| 20. | a. | Mr. X wants your expertise on the reason for a soft and white dough becoming a dark brown tasty bread. Can you help him? | CO4 | | An | 9 |
|  | b. | Milk gets split on adding NaCl. Can you explain why? | CO4 | | R | 3 |
|  |  |  |  | |  |  |
| 21. | a. | Define Saponification value and explain its importance. | CO2 | | U | 3 |
|  | b. | YY performs the experiment for Saponification value determination and comes up with the following value – Blank value – 46 ml, Value of the sample – 35 mL. Weight of the sample taken – 4.8 g. If 0.49 N HCL is used for the experiment, determine the Iodine value. Also briefly outline the procedure and make a suitable observation table. Can you infer the nature of the oil sample given? | CO2 | | An | 9 |
|  |  |  |  | |  |  |
| 22. |  | Mr. YY wants to set up a oil processing industry and he wants to manufacture groundnut oil. He needs your expertise on the process for the manufacture of refined oil from groundnuts. Can you help him highlighting the importance of each step? | CO6 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Illustrate on the reasons for the following :   1. Addition of xylanases in multigrain bread 2. Addition of proteases to protein isolates 3. Addition of cellulases to high fibre bread 4. Addition of pectinases to tomato pulp before drying | CO6 | | A | 4X3 = 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate the reasons for the following :   1. It’s better to wash and cut green leafy vegetables rather than doing the other way 2. Cooked carrots are better for health rather than raw carrots 3. Orange juice should not be stirred or aerated for a long time as it loses its nutritional quality 4. Colour change of cucumber from green to brown during pickling | CO4 | | An | 4X3 = 12 |

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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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 3 |  |  |  |  | 10 |
| CO2 |  | 6 | 6 | 9 |  |  | 21 |
| CO3 |  | 6 | 15 |  |  |  | 21 |
| CO4 |  | 15 | 9 | 21 |  |  | 45 |
| CO5 |  |  |  | 3 |  |  | 03 |
| CO6 |  | 3 | 24 |  |  |  | 27 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define Viscosity. | | CO1 | R | | 1 |
| 2. | Determine the dimension of force. | | CO6 | Ap | | 1 |
| 3. | Write the continuity equation of motion. | | CO2 | Ap | | 1 |
| 4. | Describe total pressure. | | CO2 | R | | 1 |
| 5. | Deduce the formula for finding actual discharge of an orifice meter. | | CO3 | An | | 1 |
| 6. | Indicate the parts of Venturimeter. | | CO3 | U | | 1 |
| 7. | Express the cases of water hammering. | | CO4 | C | | 1 |
| 8. | List the factors that affect power transmission through pipes. | | CO4 | R | | 1 |
| 9. | Rewrite the formula for finding time of emptying the tank completely. | | CO5 | U | | 1 |
| 10. | Define coefficient of velocity. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Analyze the term dimensional homogeneity with an example. | | CO6 | | An | 3 |
| 12. | The stream function of a two-dimensional flow is given by Ψ = 2xy. Calculate the velocity at the point P (2,3) and direction. | | CO2 | | U | 3 |
| 13. | The viscosity of an oil of sp.gr. 0.9 is measured by a capillary tube of diameter 40 mm. 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 50 kg in 100 seconds. Find the viscosity of oil. | | CO1 | | E | 3 |
| 14. | Derive the Hagen Poiseuille equation from the average velocity for a given length of the pipe. | | CO4 | | C | 3 |
| 15. | Find the head loss when a pipe of diameter 220 mm is suddenly enlarged to a diameter of 440 mm. The rate of water flow through the pipe is 250litres/s. | | CO5 | | An | 3 |
| 16. | The head of water over the center of an orifice of diameter 20 mm is 1 m. the actual discharge through the orifice is 0.85 litre/s. Find the coefficient of discharge. | | 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. | A differential manometer is connected at two points A and B of two pipes as shown in figure. The pipe A contains a liquid of sp. gr = 1.5, while B contains a liquid of sp.gr = 0.9. The pressures at A and B are 1and 1.8 kgf/cm2 respectively. Fin the difference in mercury level in the differential manometer. | CO1 | | Ap | 6 |
|  | b. | Describe the Rayleigh’s method. Find an expression for the drag force on smooth sphere of diameter, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity µ. | CO6 | | C | 6 |
|  |  |  |  | |  |  |
| 18. | a. | State the Bernoulli’s theorem and deduce an expression for Bernoulli’s theorem | CO4 | | U | 7 |
|  | b. | The velocity potential function is given by an expression  ɸ = - xy3/3 – x2 + x3y/3 +y2   1. Find the velocity components x and y direction. 2. Show that ɸ represents a possible case of flow. | CO3 | | An | 5 |
|  |  |  |  | |  |  |
| 19. | a. | A horizontal pipe of diameter 480 mm is suddenly contracted to a diameter of 240 mm. The pressure intensities in the large and smaller pipe are given as 13.734 N/cm2 and 11.772 N/cm2 respectively. Find the loss of head due to contraction if Cc = 0.62. Also determine the rate of flow of water. | CO5 | | E | 6 |
|  | b. | Derive an expression for rate of flow through venturimeter. | CO5 | | Ap | 6 |
|  |  |  |  | |  |  |
| 20. |  | Explain the capillary tube and falling sphere resistance method with a diagram. | CO3 | | An | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Examine the rate of flow of water, for the series and parallel flow in pipes. | CO5 | | E | 9 |
|  | b. | Write short notes on water hammering. | CO4 | | U | 3 |
|  |  |  |  | |  |  |
| 22. |  | Distinguish major and minor energy losses and rewrite an expression for finding minor loss due to sudden enlargement. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Calculate the pressure due to a column of 0.3 m a) water b) an oil of specific gravity 0.8 and c) mercury of specific gravity 13.6. Take density of water ρ = 1000 kg/m3. | CO2 | | E | 7 |
|  | b. | Describe the various pressure measuring devices with a neat sketch. | CO2 | | R | 5 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Propose the discharge equations for fully submerged and partially submerged orifice. | CO5 | | C | 8 |
|  | b. | A rectangular orifice of 2 m width and 1.2 m deep is fitted in one side of a large tank. The water level on one side of the orifice is 3 m above the top edge of the orifice, while on the other side of the orifice, the water level is 0.5 m below its top edge. Calculate the discharge through the orifice if Cd = 0.64. | CO5 | | E | 4 |

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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 |  | 6 |  | 3 |  | 10 |
| CO2 | 6 | 3 | 1 |  | 7 |  | 17 |
| CO3 |  | 1 |  | 18 |  |  | 19 |
| CO4 | 1 | 10 |  |  |  | 4 | 15 |
| CO5 | 1 | 1 | 6 | 15 | 22 | 8 | 53 |
| CO6 |  |  | 1 | 3 |  | 6 | 10 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Bacterial cell grown on hydrocarbon wastes from the petroleum industry are a source of \_\_\_\_\_\_\_\_\_\_. | CO1/U | 1 |
| 2. | Prebiotics are the nutrients that bacteria uses as a fuel source and these include dietary fibre and \_\_\_\_\_\_\_\_\_. | CO1/U | 1 |
| 3. | A substance containing both prebiotic and probiotic is called as \_\_\_\_\_\_\_\_\_. | CO2/Ap | 1 |
| 4. | \_\_\_\_\_\_\_\_\_ is the final electron acceptor of the lactic acid fermentation. | CO2/Ap | 1 |
| 5. | Graph where x-axis shows the temperature and the y-axis shows the killing time  The x-axis shows the temperature and the y-axis shows the killing time. This is with respect to spores in a suspension. Curve a = 100,000 spores/ml and b= 1,000 spores/ml. Above curve a is the region of spores killed and below the region b is the region of spores survived. Inferred the graph that, \_\_\_\_\_\_\_\_\_\_\_, more heat resistant the suspension. | CO3/U | 1 |
| 6. | Statement 1: Heat resistance of an organism is designated by the ‘c’ value.  Statement 2: The ‘z’ value stands for the number of degrees centigrade required for the thermal death time curve to traverse one  a) True, False b) True, True c) False, False d) False, True | CO3/U | 1 |
| 7. | High concentration of DDT disturbs, \_\_\_\_\_\_\_\_\_\_. | CO4/Ap | 1 |
| 8. | The bacterium (*Clostridium botulinum*) which causes botulism is an \_\_\_\_\_\_\_\_\_\_. | CO4/Ap | 1 |
| 9. | \_\_\_\_\_\_\_\_\_\_ induce radioactivity in food items. | CO5/An | 1 |
| 10. | \_\_\_\_\_\_\_\_\_\_ is known as red algae. | CO5/An | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Generalize the history and development of food Microbiology in the context of the industrial development. | CO1/U | 3 |
| 12. | Relate the correlation between the quality of milk composition and its corresponding fermented dairy products. | CO2/Ap | 3 |
| 13. | Describe the ill effects of food spoilage bacteria in the fermented foods. | CO3/U | 3 |
| 14. | Discuss the mechanism of mycotoxicosis in humans with suitable example. | CO4/Ap | 3 |
| 15. | Contrast the benefits of Natural Food Preservatives from its synthetic counterpart. | CO5/An | 3 |
| 16. | Write down the significance of High pressure processing in food industries. | CO6/U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Demonstrate the Characteristics of predominant microorganisms in foods with suitable examples. | CO1/U | 8 |
| b. | State the microbiologically significant parameters involved in quality testing of foods. | CO1/U | 4 |
|  |  |  |  |  |
| 18. | a. | Deduce the methods and practice for the production of  (i) Sauerkraut and (ii) wine. | CO2/Ap | 8 |
| b. | Implement the strategy for the microbiological fermentation of starter cultures. | CO2/Ap | 4 |
|  |  |  |  |  |
| 19. |  | Expound the significant factors involved with the microbial spoilage of the food items including, (i) egg, (ii) fish and (iii)milk in detail. | CO3/U | 12 |
|  |  |  |  |  |
| 20. |  | Execute the etimology, illeffects and remedy for the following microbial food spoilage diseases.   1. Camphylobacteriosis. 2. Pathogenic *E.coli.* 3. Protozoan *Entamoeba histolytica.* | CO4/Ap | 12 |
|  |  |  |  |  |
| 21. | a. | Analyze the theory behind the spoilage of canned foods and elaborate on the types of spoiled cans in detail. | CO5/An | 8 |
| b. | Elucidate the Non-thermal methods of preservation implemented in food industries. | CO5/An | 4 |
|  |  |  |  |  |
| 22. | a. | Appraise the role of microbial enzymes involved with the food spoilage prevention. | CO3/U | 8 |
| b. | Give a detailed account on the food spoilage related to vegetables and fruits. | CO3/U | 4 |
|  |  |  |  |  |
| 23. | . | Expound the detrimental effects and remedy measures available for the following diseases conditions.   1. Salmonellosis. 2. Listeriosis. 3. Vibrio gastroentitis – Enteric viruses. | CO4/Ap | 12 |
|  |  |  |  |  |
|  |  | **COMPULSORY** | | |
| 24. |  | Explicate the theory and practice of the following:   1. Enzyme Linked Immunosorbent Assay (ELISA). 2. DNA hybridization. 3. Surface Plasmon resonance based Biosensors. | CO6/U | 12 |

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|  | **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 Taxonomy** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | - | 17 | - | - | - | - | 17 |
| CO2 | | - | - | 17 | - | - | - | 17 |
| CO3 | | - | 29 | - | - | - | - | 29 |
| CO4 | | - | - | 29 | - | - | - | 29 |
| CO5 | | - | - | - | 17 | - | - | 17 |
| CO6 | | - | 15 | - | - | - | - | 15 |
|  | | | | | | | | **124** |

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define metabolism. | | CO2 | R | 1 |
| 2. | Define glycogenolysis. | | CO3 | R | 1 |
| 3. | Distinguish mono and poly unsaturated fatty acids? | | CO2 | U | 1 |
| 4. | Describe low density lipoprotein. | | CO1 | U | 1 |
| 5. | List the chemical composition of proteins? | | CO3 | U | 1 |
| 6. | Write about gout. | | CO5 | Ap | 1 |
| 7. | Define health. | | CO3 | R | 1 |
| 8. | Write about optimal nutrition? | | CO4 | C | 1 |
| 9. | Explain anti-nutritional factors. | | CO5 | An | 1 |
| 10. | Summarize the source and the major toxicity symptoms of protease inhibitors. | | CO5 | E | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List the importance of NADPH. | | CO1 | R | 3 |
| 12. | Distinguish the functions and roles of fatty acids. | | CO3 | E | 3 |
| 13. | Discuss in detail the nutritional classification of amino acids. | | CO2 | U | 3 |
| 14. | Explain BMI and its calculation. Also calculate your BMI. | | CO4 | Ap | 3 |
| 15. | Describe cyanogen. | | CO5 | U | 3 |
| 16. | Summarize any 5 types of space foods? | | CO6 | 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. |  | Describe in detail the glycolysis pathway. | CO1 | R | 12 |
| 18. |  | Explain in detail beta oxidation of fatty acids. | CO3 | U | 12 |
| 19. | a. | Recall the metabolic disorders of urea cycle. | CO2 | R | 6 |
|  | b. | Describe urocanic acid pathway. | CO2 | R | 6 |
| 20. | a. | Explain in detail the biochemical and laboratory methods of nutritional assessment. | CO4 | An | 6 |
|  | b. | Explain in detail the clinical methods of nutritional assessment. | CO4 | An | 6 |
| 21. | a. | Write in detail the enzyme inhibitors. | CO5 | Ap | 6 |
|  | b. | Write a short note on lectins, mode of action, detection, and detoxification. | CO5 | Ap | 6 |
| 22. | a. | Summarize the dietary modifications for Jaundice. | CO6 | E | 6 |
|  | b. | Summarize the dietary modifications for Hepatitis. | CO6 | E | 6 |
| 23. | a. | Write in detail the nutrient supplementation and fortification. | CO4 | C | 6 |
|  | b. | Write about nutritional labelling and its importance. | CO5 | C | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the common concerns and complications during pregnancy. | CO6 | U | 6 |
|  | b. | Explain in detail the nutrients need during pregnancy. | CO6 | U | 6 |

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|  | **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 values. |
| CO6 | Formulate specialized nutrition for pediatric, geriatric and sport’s needs. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 15 | 1 | - | - | - | - | 16 |
| CO2 | 16 | 1 | - | - | - | - | 17 |
| CO3 | 2 | 13 | - | - | 3 | - | 18 |
| CO4 | - | - | 3 | 12 | - | 7 | 22 |
| CO5 | 3 | - | 13 | 1 | 1 | 6 | 24 |
| CO6 | - | 12 | - | - | 15 | - | 27 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define Zeroth law of thermodynamics. | | CO1 | R | | 1 |
| 2. | List the conditions for steady state system. | | CO1 | U | | 1 |
| 3. | Refrigeration is based on \_\_\_\_\_\_\_\_ law of thermodynamics. | | CO2 | R | | 1 |
| 4. | \_\_\_\_\_\_\_\_ is a measure of randomness at the molecular level. | | CO2 | R | | 1 |
| 5. | The net useful work is otherwise called \_\_\_\_\_\_\_\_ free energy. | | CO3 | R | | 1 |
| 6. | Avogadro No is used to finding no of \_\_\_\_\_\_\_\_ in the given substance. | | CO3 | U | | 1 |
| 7. | The partial molar free energy is otherwise called \_\_\_\_\_\_\_\_. | | CO4 | U | | 1 |
| 8. | \_\_\_\_\_\_\_\_ heat cannot be measured with thermometer. | | CO4 | R | | 1 |
| 9. | The dryness fraction in the superheated vapor is \_\_\_\_\_\_\_\_. | | CO5 | R | | 1 |
| 10. | The unit for specific enthalpy is \_\_\_\_\_\_\_\_. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define Joule Thompson Coefficient and state its significance. | | CO1 | | An | 3 |
| 12. | Interpret Kelvin Planck’s statement of the second law of thermodynamics with a neat sketch. | | CO2 | | U | 3 |
| 13. | Distinguish reference, energy and derived properties. | | CO3 | | An | 3 |
| 14. | State the conditions at which real gas will show ideal behavior. | | CO4 | | U | 3 |
| 15. | Differentiate saturated liquid from saturated vapor. | | CO5 | | An | 3 |
| 16. | State-specific humidity with its unit. | | 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. | Show that work is a path function by comparing the work done for isothermal reversible work of expansion and free expansion. | CO1 | | U | 8 |
|  | b. | A closed system receives an input heat of 450 kJ and increases the internal energy of the system by 325 kJ. Determine the work done by the system. | CO2 | | An | 4 |
| 18. | a. | Derive the general form of Steady Flow Energy Equation and state its application in steam generator. | CO5 | | A | 8 |
|  | b. | Explain the concept of entropy with suitable example. | CO3 | | An | 4 |
| 19. | a. | Discuss the following equation of state i. Ideal gas equation ii. Vander Waals equation iii. Virial equation. | CO3 | | An | 10 |
|  | b. | State the assumptions made in deriving the ideal gas equation. | CO3 | | A | 2 |
| 20. | a. | Describe in detail partial molar properties and properties of solutions. | CO4 | | U | 10 |
|  | b. | Differentiate ideal and non-ideal solutions. | CO5 | | U | 2 |
| 21. | a. | Classify different types of boilers and give their application. | CO5 | | U | 8 |
|  | b. | Differentiate saturated and superheated steam. | CO3 | | U | 4 |
| 22. | a. | Interpret state and path function and give one example for each. | CO2 | | A | 6 |
|  | b. | 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. | CO2 | | E | 6 |
| 23. | a. | Relate enthalpy and Gibbs free energy and obtain two Maxwell’s thermodynamic relations based on these energies. | CO2 | | An | 10 |
|  | b. | Define fugacity and what its value in standard state is. | CO1 | | A | 2 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the following Psychrometric process with a neat sketch  i. Heating and humidification ii. Cooling and dehumidification. | CO6 | | A | 8 |
|  | b. | One kg of gas expands at constant pressure from 0.085m3 to 0.13 m3. If the initial temperature of the gas is 225°C, find the final temperature, net heat transfer, change in internal energy, and the pressure of the gas. | CO1 | | E | 4 |

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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. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 1 | 2 | 7 | - | - | 11 |
| CO2 | | 2 | 11 | 6 | 10 | 6 | - | 35 |
| CO3 | | 1 | 5 | 2 | 17 | - | - | 25 |
| CO4 | | 1 | 14 | - | - | - | - | 15 |
| CO5 | | 1 | 10 | 8 | 3 | - | - | 22 |
| CO6 | | - | 4 | 8 | - | 4 | - | 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** | **Course Outcome** | **Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Highlight the test used to determine the fat content in milk. | CO1 | R | 1 |
| 2. | Quote the temperature of milk at milk receiving area. | CO2 | R | 1 |
| 3. | Write the hardness of water for effective cleaning. | CO2 | C | 1 |
| 4. | Recall the name given to a heat treatment process done under vacuum. | CO2 | R | 1 |
| 5. | Write the formula for determining SNF in cream. | CO3 | C | 1 |
| 6. | What is the significance of farrall Index? | CO3 | R | 1 |
| 7. | Name the flavouring compound responsible for flavor of Butter. | CO2 | R | 1 |
| 8. | Name the residual liquid during cheese manufacturing. | CO2 | R | 1 |
| 9. | What is the time temperature for UHT pasteurization of ice cream mix? | CO3 | R | 1 |
| 10. | What is the spacing between the drums in drum dryer? | CO5 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Enlist the Quality control test for milk. | CO3 | R | 3 |
| 12. | Write a note on vacuum filing of milk bottles. | CO5 | C | 3 |
| 13. | Classify different types of cream separators. | CO6 | An | 3 |
| 14. | Categorize cheese based on the physical state of structure. | CO2 | An | 3 |
| 15. | What is the role of emulsifiers in ice cream? | CO2 | R | 3 |
| 16. | What are the different membrane processing methods? | CO5 | R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23, Q.No. 24 is compulsory)** | | | | | |
| 17. |  | Describe the method of any four methods of milk chilling. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Describe basic components equipment of HTST pasteurizer | CO6 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Describe the factors affecting milk clarification. | CO3 | U | 6 |
| b. | Explain the types of Homogenizers. | CO6 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Describe the process of cheddar cheese manufacture along with the flowchart. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the different types of atomization in spray drier. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Describe the working principle of self sludging separators. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Describe the various unit operation involved in straight through can washers. | CO6 | U | 12 |
|  |  | **COMPULSORY QUESTION** | | | |
| 24. |  | Explain different types of membrane used in milk processing industries. | CO5 | U | 12 |

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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 | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | -- | -- | -- | -- | -- | 1 |
| CO2 | | 7 | -- | -- | 3 | -- | 1 | 11 |
| CO3 | | 5 | 18 | -- | -- | -- | 1 | 24 |
| CO4 | | -- | -- | -- | -- | -- | -- |  |
| CO5 | | 4 | 24 | -- | -- | -- | 3 | 31 |
| CO6 | | -- | 54 | -- | 3 | -- | -- | 57 |
|  | | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Examine the method of separating granular materials into various fractions based on size. | | CO1 | U | | 1 |
| 2. | The pneumatic separation is based on the difference in \_\_\_\_\_\_ properties of the food grains. | | CO1 | R | | 1 |
| 3. | State the property of gaining or loosing moisture by a grain based on the atmospheric conditions. | | CO2 | R | | 1 |
| 4. | Reproduce an expression for the Henderson model. | | CO2 | R | | 1 |
| 5. | State the law which indicates that the grinding energy is proportional to the logarithm of reduction ratio. | | CO3 | U | | 1 |
| 6. | Drying rate periods in a drying rate curve can be categorized as \_\_\_\_\_\_\_. | | CO3 | R | | 1 |
| 7. | Describe the role of filter aids in filtration process. | | CO4 | U | | 1 |
| 8. | Locate the forces acting on a particle moving in a fluid. | | CO4 | R | | 1 |
| 9. | Reproduce an expression for crushing efficiency. | | CO5 | U | | 1 |
| 10. | List any two applications of size reduction in food processing. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Classify the screen fractions and interpret ideal screens. | | CO1 | | An | 3 |
| 12. | 500 kg of paddy at 22% moisture content (wb) is dried to 14% moisture content (wb) for milling. Calculate the amount of moisture removed in drying. | | CO2 | | E | 3 |
| 13. | Examine the working of ball mill. | | CO3 | | A | 3 |
| 14. | Differentiate sedimentation and centrifugation process. | | CO4 | | An | 3 |
| 15. | Criticize the centrifuge effect or g-number. | | CO5 | | E | 3 |
| 16. | Appraise the working of ribbon mixer. | | 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. | Elaborate on the specific gravity separator with a neat sketch. | CO1 | | U | 6 |
|  | b. | Illustrate the working principle of pneumatic and aspirator separator with a neat sketch. | CO1 | | A | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Elaborate on the drying theory with a help of a drying curve. | CO3 | | U | 8 |
|  | b. | Calculate the equilibrium moisture content of brinjal seed at the RH of 10% and temperature of 50° C using Henderson’s equation. Given that constant c is 6.5x10-6 and n is 1.8. | CO3 | | E | 4 |
|  |  |  |  | |  |  |
| 19. |  | Elaborate on the principle, theory and laws of size reduction. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 20. | a. | A coffee decoction has solid suspended in it. A sedimenter is used to settle the solids to decant the clear decoction. The suspended solids have an average diameter of 100µ.Find the terminal velocity if the density of the solid is 1100 kg/m3and the specific gravity of decoction is 1.06 and its viscosity is 1.1 cP. | CO4 | | An | 6 |
|  | b. | Explain the principle and working of rotary vacuum filter press with a neat sketch. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Deduce an equation for finding radius of the neutral zone. | CO3 | | An | 6 |
|  | b. | Describe the construction and working of Basket type centrifuge. | CO6 | | A | 6 |
|  |  |  |  | |  |  |
| 22. | a. | During evaluation of an air screen grain cleaner with 2 screens 250g samples were collected for analysis of clean seed fraction from different outlets. The data are presented in the following table. Calculate the cleaning efficiency of the cleaner.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Sample fraction** | **Feed (g)** | **Clean grain outlet (g)** | **Blower outlet (g)** | **Oversize outlet (g)** | **Undersize outlet (g)** | | Cleaned seed (g) | 231.25 | 246.5 | 1.25 | 4.5 | 2.0 | | Impurities (g) | 18.75 | 3.5 | 248.75 | 245.5 | 248.0 | | CO5 | | E | 8 |
|  | b. | Examine the principle of lyophilization. | CO2 | | A | 4 |
|  |  |  |  | |  |  |
| 23. |  | Elaborate on the principle of sedimentation process and derive an expression for settling velocity of the particle in a fluid. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | A fortified high protein dough is being made by adding 20% soya flour to the maida flour. The two dry flours are mixed in a ribbon mixer to make the dough. After certain time, say 10 minutes, 6 samples were collected and analyzed for soya flour, the following are the fractional compositions.  0.2195, 0.22, 0.19, 0.185, 0.205, 0.191  Calculate mixing index and standard deviations. Find how much time it needs to be mixed for getting a variance of 1 x 10-4. | CO6 | | E | 12 |

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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 equipment’s for processing. |
| CO5 | Evaluate the efficiency of equipment’s used in unit operations of foods. |
| CO6 | Design equipment’s for screening, grading, drying, size reduction, mechanical separation and mixing of foods. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 7 | 6 | 3 | - | - | 17 |
| CO2 | 2 | - | 4 | 12 | 3 | - | 21 |
| CO3 | 1 | 9 | 15 | 6 | 4 | - | 35 |
| CO4 | 1 | 1 | 6 | 9 | - | - | 17 |
| CO5 | - | 1 | - | - | 11 | - | 12 |
| CO6 | - | 1 | 6 | 3 | 12 | - | 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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the plant hormone that regulates many aspects of growth, development, and senescence of plants. | | CO1 | R | | 1 |
| 2. | Name the type of fruits containing one large pit or seed. | | CO1 | R | | 1 |
| 3. | State the cause of lethal effect of ozone. | | CO2 | R | | 1 |
| 4. | List out any two types of grading machines for fruits. | | CO3 | R | | 1 |
| 5. | Tell the hydraulic pressure for plate press. | | CO3 | R | | 1 |
| 6. | Recall the scientist who invented canning process. | | CO3 | R | | 1 |
| 7. | Tell the TSS of fruit jelly. | | CO4 | R | | 1 |
| 8. | Recall the acid added in small quantity to invert portion of cane sugar to prevent crystallization. | | CO3 | R | | 1 |
| 9. | Write the other name for Hurdle Technology. | | CO6 | C | | 1 |
| 10. | Name the common gases used in MAP. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the grading parameters commonly used by food industries | | CO2 | | C | 3 |
| 12. | Classify fruits with the help of suitable examples. | | CO1 | | U | 3 |
| 13. | Point out the quality changes during storage of tomato Ketchup. | | CO4 | | An | 3 |
| 14. | Discuss the merits and demerits of metal cans. | | CO3 | | U | 3 |
| 15. | List the seven principles of HACCP. | | CO5 | | R | 3 |
| 16. | Write short note on gases used in MAP. | | CO5 | | 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. | Explain the chemical composition of fruits and vegetables. | CO1 | | An | 6 |
|  | b. | Categorize the causes responsible for post-harvest losses. | CO2 | | E | 6 |
|  |  |  |  | |  |  |
| 18. |  | Recall the different methods used for preservation of juices. | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 19. |  | Describe the steps involved in canning of fruits and vegetables | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Explain the production process of jelly with schematic representation | CO4 | | An | 6 |
|  | b. | State the definition of jelly given by FSSAI | C04 | | R | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Point out the mechanism of hurdle technology. | CO5 | | An | 6 |
|  | b. | Explain principle of pulse electric field used for preservation of fruits and vegetables. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Discuss about the microorganisms responsible for spoilage of fruit juices. | CO3 | | U | 6 |
|  | b. | Explain aseptic packaging for foods giving suitable examples. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the Mineral deficiency disorders in fruits. | CO1 | | An | 6 |
|  | b. | Explain the manufacturing process involved in making candied fruits. | CO4 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Combine the salient features of AGMARK and ISO22000 | CO5 | | C | 12 |

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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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 3 | - | 12 | - | - | 17 |
| CO2 | 1 | - | - | - | 6 | 3 | 10 |
| CO3 | 3 | 21 | - | - | - | - | 25 |
| CO4 | 20 | - | 3 | 12 | - | - | 35 |
| CO5 | 3 | 12 | - | 6 | - | 15 | 36 |
| CO6 | - | - | - | - | - | 1 | 1 |
|  | | | | | | | **124** |

Graphical user interface, application

Description automatically generated with medium confidence

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

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| **Q. No.** | **Questions** | **Course Outcome** | **Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Define HLB value. | CO1 | R | 1 |
| 2. | Define the term Glycemic index. | CO3 | A | 1 |
| 3. | List the types of dispersions. | CO1 | R | 1 |
| 4. | Define the term “food additives”. | CO2 | U | 1 |
| 5. | State the full form of NOAEL and BMD. | CO2 | U | 1 |
| 6. | Classify the dough improvers based on complexity. | CO1 | R | 1 |
| 7. | State the definition of preservative according to FSSAI. | CO1 | R | 1 |
| 8. | Enlist the names of two important emulsifying agents. | CO2 | U | 1 |
| 9. | State the term for “The permissible intake amount of substances unintentionally added to food, that can be ingested orally daily over a lifetime without an appreciable health risk”. | CO5 | E | 1 |
| 10. | Sate the unit of ADI for a chemical substance. | CO2 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Explain the term Neutralizing value (NV) and illustrate the formula for NV. | CO1 | R | 3 |
| 12. | Define the role of a chelating agent along with formula for EDTA. | CO5 | E | 3 |
| 13. | State the problem that is associated with bacterial amylase and how it can be overcome. | CO2 | U | 3 |
| 14. | Illustrate with the help of a schematic the structure of a typical emulsifier/surfactant. | CO4 | A | 3 |
| 15. | List the bullet points (3) related to the nutrient fact labels for polyols. | CO3 | An | 3 |
| 16. | List atleast 5 functional classes of additives. | CO3 | An | 3 |

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| **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 types of emulsifiers and explain HLB value. | CO1 | R | 6 |
| b. | Classify the types of humectants. | CO4 | A | 6 |
| 18. | a. | Elucidate the types of fat replacers and its applications. | CO2 | A | 6 |
| b. | Describe the stabilizers and thickeners in terms of its function, mechanism and provide suitable examples. | CO3 | A | 6 |
| 19. |  | Choose any ONE food category. Name atleast TWO Products available in the market along with their brand names. List down the ingredients for the category of products and describe the role of each ingredient for 19 (a). | CO6 | C | 12 |
| 20. | a. | Write down the procedure for framing regulations according to FSSAI. | CO5 | A | 6 |
| b. | Explain the term colloidal systems and their behavior with examples. | CO3 | E | 6 |
| 21. |  | Write a short note on fat replacers. Distinguish between fat replacer, fat mimetic and fat substitute with example. | CO4 | A | 12 |
| 22. | a. | Explain the role of polyols in food. | CO2 | U | 6 |
| b. | Distinguish between nutritive and non-nutritive sweeteners with example. | CO4 | An | 6 |
| 23. |  | Describe the importance of antioxidants, who needs it and why. Recall the factors affecting antioxidant activity. | CO4 | An | 12 |
|  |  | **COMPULSORY QUESTION** |  |  |  |
| 24. | a. | Describe in brief about the FSSAI and its importance for food business operators for product formulation discussing atleast one product category. | CO5 | E | 6 |
| b. | Define the term “Food adulteration” state reasons for food adulteration. Provide ANY TWO examples of food adulteration and its method of detection. | CO4 | An | 6 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 |  | - | - | - | - | 13 |
| CO2 | - | 13 | 6 | - | - | - | 19 |
| CO3 | - | - | 7 | 6 | 6 |  | 19 |
| CO4 | - | - | 21 | 24 |  |  | 45 |
| CO5 | - | - | 6 |  | 10 |  | 16 |
| CO6 | - | - |  |  |  | 12 | 12 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define unit cell. | | CO1 | R | | 1 |
| 2. | Enlist the different types of secondary bond. | | CO1 | R | | 1 |
| 3. | Justify “Strain is dimensionless quantity”. | | CO2 | E | | 1 |
| 4. | State Poisson’s ratio. | | CO5 | R | | 1 |
| 5. | Define fracture toughness. | | CO5 | R | | 1 |
| 6. | Define Fatigue. | | CO5 | R | | 1 |
| 7. | Draw a well labeled diagram of corrosion triangle. | | CO4 | C | | 1 |
| 8. | Write a balanced reaction occurring at anode during corrosion of Iron | | CO4 | E | | 1 |
| 9. | Recall the passivation process. | | CO4 | R | | 1 |
| 10. | Define carbon steel. | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Correlate the significance of material science in food processing technology. | | CO2 | | An | 3 |
| 12. | Differentiate ductile and brittle material. | | CO3 | | An | 3 |
| 13. | Distinguish between Transgranular and intergranular fracture. | | CO4 | | An | 3 |
| 14. | Explain in detail the high cycle fatigue. | | CO4 | | U | 3 |
| 15. | Compare carbon and stainless steel. | | CO3 | | E | 3 |
| 16. | List the advantages of microscopy method for particle analysis. | | 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. | Compare Edge dislocation with screw dislocation. | CO1 | | E | 6 |
|  | b. | Discuss the formation of ionic bond in sodium chloride crystal. | CO1 | | E | 6 |
| 18. | a. | A mild steel wire of radius 0.5 mm and length 3m is stretched by a force of 49N. Calculate 1) longitudinal stress, b) longitudinal strain c) elongation produced in the body if Y=2.1x1011 N/m2. g = 9.8 m/s2. | CO4 | | E | 6 |
|  | b. | Explain Stress-strain curve for a material subjected to tensile stress. | CO4 | | U | 6 |
| 19. |  | Describe the Corrosion mechanism and its prevention. | CO4 | | U | 12 |
| 20. |  | Summarize the steps involved in ductile fracture with diagram. | CO5 | | U | 12 |
| 21. |  | Explain the Quenching process. | CO6 | | U | 12 |
| 22. | a. | A metal wire 1m long and of 2mm diameter is stretched by a load of 40 kg. If Y = 7 x 1010 N/m2 for the metal, find the 1) stress, 2) strain, 3) force constant of the material of the wire. | CO5 | | An | 6 |
|  | b. | Write a note on Stress-Strain relationship with diagram. | CO5 | | E | 6 |
| 23. | a. | Explain Miller indices, how will you determine them. | CO1 | | U | 6 |
|  | b. | Explain Frenkel and Schottky defects. | CO1 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the working principle of X-ray diffraction with neat diagram. | CO5 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Enumerate the fundamentals of various bonds in materials. |
| CO2 | Understand the importance of strength of material in choice of material of construction. |
| 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 / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 12 | - | - | 12 | - | 26 |
| CO2 | - | - | - | 3 | 1 | - | 4 |
| CO3 | 1 | - | - | 3 | 3 | - | 7 |
| CO4 | 1 | 21 | - | 3 | 7 | 1 | 33 |
| CO5 | 6 | 24 | - | 6 | 6 | - | 42 |
| CO6 | - | 12 | - | - | - | - | 12 |
|  | | | | | | | **124** |

**Graphical user interface, application

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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Amount of heat transfer per unit area per unit time is called \_\_\_\_\_\_\_. | | CO1 | U | 1 |
| 2. | The unit for thermal conductivity is \_\_\_\_\_\_\_. | | CO1 | R | 1 |
| 3. | Thermal resistance in case of convective heat transfer has the unit of \_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 4. | The edge facing the direction of flow is called \_\_\_\_\_\_\_ edge. | | CO2 | R | 1 |
| 5. | The ratio of molecular diffusivity of momentum to molecular diffusivity of heat is called \_\_\_\_\_\_\_. | | CO3 | U | 1 |
| 6. | When two fluid streams flow in same direction, such type of flow is called \_\_\_\_\_\_\_ flow. | | CO3 | R | 1 |
| 7. | Film heat transfer coefficients are higher for \_\_\_\_\_\_\_ condensation than \_\_\_\_\_\_\_ condensation. | | CO4 | U | 1 |
| 8. | For a perfect black body absorptivity is equal to \_\_\_\_\_\_\_. | | CO4 | R | 1 |
| 9. | The fraction of the incident radiation absorbed is known as \_\_\_\_\_\_\_. | | CO5 | R | 1 |
| 10. | The driving force for diffusion is \_\_\_\_\_\_\_ gradient. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Define Fourier’s law for steady state unidirectional heat conduction. | | CO1 | R | 3 |
| 12. | Describe energy thickness in boundary layer. | | CO2 | U | 3 |
| 13. | Show the relation between overall heat transfer coefficients with individual film transfer coefficients. | | CO3 | A | 3 |
| 14. | Compare absorptivity and reflectivity in radiation. | | CO4 | An | 3 |
| 15. | State the advantages of double pipe heat exchangers and its drawbacks. | | CO5 | U | 3 |
| 16. | Explain briefly the analogy between heat, mass and momentum transfer. | | 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. | Derive an expression for heat transfer through a furnace wall made of three different materials in series. Assume k1, k2, and k3 to be the thermal conductivities of materials and x1, x2, and x3 the respective thicknesses. Assume hot face and cold face temperatures to be T1 and T2 respectively. | CO1 | A | 10 |
| b. | Define thermal conductivity of the materials. | CO1 | R | 2 |
| 18. | a. | Compose displacement and momentum thickness for laminar flow over a flat plate. | CO3 | C | 8 |
| b. | Deduce an equation for radiation heat transfer coefficient. | CO3 | An | 4 |
| 19. |  | Predict an equation for film heat transfer coefficient using dimensional analysis. | CO4 | A | 12 |
| 20. | a. | Compare and contrast Grey body with black body. | CO3 | A | 4 |
| b. | Explain various regimes of boiling with boiling curve. | CO5 | An | 8 |
| 21. |  | Summarize the construction and operation of 1,1 shell and tube heat exchanger. | CO5 | E | 12 |
| 22. | 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. | CO1 | An | 8 |
| b. | Summarize the critical radius of insulation for a cylindrical surface. | CO1 | E | 4 |
|  |  |  |  |  |  |
| 23. | a. | Show that in forced convection the Nusselt number is a function of Reynolds number and Prandtl number. | CO2 | A | 10 |
| b. | Summarize the characteristics of boundary layer | CO2 | E | 2 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Elaborate on the steady state molecular diffusion in fluids. | CO6 | A | 6 |
| b. | Criticize the two-film theory on interphase mass transfer process. | CO6 | An | 6 |

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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 |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 | 1 | 10 | 8 | 4 |  | 29 |
| CO2 | 2 | 3 | 10 |  | 2 |  | 17 |
| CO3 | 1 | 1 | 7 | 4 |  | 8 | 21 |
| CO4 | 1 | 1 | 12 | 3 |  |  | 17 |
| CO5 | 1 | 3 |  | 8 | 12 |  | 24 |
| CO6 | 1 | 3 | 6 | 6 |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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

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| **Q. No.** | **Questions** | | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | | | During evaporation of edible solutions, the BPR-boiling point rise should be \_\_\_\_\_\_\_\_\_\_\_\_ and the foaming and scale formation should be \_\_\_\_\_\_\_\_\_\_\_\_. | | CO1 | U | | 1 |
| 2. | | | Statement 1: Boiling point rise is due to the colligative properties due to the presence of solid particles in the solvent. Statement 2: Boiling point rise is due to the increase in pressure at the bottom of the solvent due to hydro-static head of the column.  State true or false. | | CO1 | R | | 1 |
| 3. | | | Batch distillation an unsteady state operation (True/false). | | CO2 | R | | 1 |
| 4. | | | \_\_\_\_\_\_\_\_\_\_\_\_ is the diagonal of the x-y diagram in distillation. | | CO2 | R | | 1 |
| 5. | | | Name the solvent used in extraction that reduces the risk of explosion hazard. | | CO3 | U | | 1 |
| 6. | | | Classify extraction equipment. | | CO3 | R | | 1 |
| 7. | | | Define *channeling* in gas absorption. | | CO4 | U | | 1 |
| 8. | | | Describe *loading point* in relation to pressure drop in gas absorbers. | | CO4 | R | | 1 |
| 9. | | | Illustrate the sequence of crystallization. | | CO5 | U | | 1 |
| 10. | | | Define *incrustation* in crystallizers. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Generalize the steam jet ejector system. | | | | CO4 | | C | 3 |
| 12. | Label A1, A2, A3 and A4 with formulae in the above Thiele plot for distillation. | | | | CO4 | | R | 3 |
| 13. | Appraise the factors affecting the rate of extraction. | | | | CO5 | | E | 3 |
| 14. | Differentiate adsorbant and absorbant. | | | | CO6 | | An | 3 |
| 15. | Describe the draft tube baffle crystallizer. | | | | CO5 | | A | 3 |
| 16. | Explain the effect of extrusion on proteins in food. | | | | 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. | | Deduce the mass and heat balance in a single effect evaporator with figures and equations where necessary. | CO4 | | E | 6 |
|  | | b. | | Compare any four types of evaporators pertaining to their advantages and disadvantages. | CO5 | | E | 6 |
|  | |  | |  |  | |  |  |
| 18. | | a. | | Explain flash distillation with a neat sketch. | CO4 | | U | 6 |
|  | | b. | | A batch of crude pentane contains 15 mol percent n-butane and 85 percent n-pentane. If a simple batch distillation at atmospheric pressure is used to remove 90 percent of the butane, how much pentane would be removed? Find the composition of the remaining liquid. | CO6 | | C | 6 |
|  | |  | |  |  | |  |  |
| 19. | | a. | | Explain in detail the working of multi stage counter current extraction. | CO5 | | An | 6 |
|  | | b. | | List any three commonly used solvents with their distinguishing characteristic. | CO6 | | R | 6 |
|  | |  | |  |  | |  |  |
| 20. | |  | | Describe the three types of tower packings in gas absorption. | CO5 | | U | 12 |
|  | |  | |  |  | |  |  |
| 21. | | a. | | List the advantages of scraped surface crystallizers over unscraped surface crystallizers. | CO3 | | R | 6 |
|  | | b. | | We have a 40 percent magnesium chloride solution in water at 20ºC. Estimate the magnesium chloride crystallized out if the saturated concentration is only 54.5 kg/100 kg of water at 20⁰C. | CO5 | | E | 6 |
|  | |  | |  |  | |  |  |
| 22. | | a. | | Examine Bollman’s extractor with a neat sketch. | CO6 | | A | 6 |
|  | | b. | | List the operational constraints in Super Critical Fluid Extraction. | CO5 | | R | 6 |
|  | |  | |  |  | |  |  |
| 23. | | a. | | Justify the material balances in gas absorption with supporting equations for equilibrium conditions. | CO5 | | C | 6 |
|  | | b. | | Interpret the limiting gas-liquid ratio with a supporting graph. | CO5 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | | a. | | Explain the food application of extrusion. | CO6 | | U | 6 |
|  | | b. | | Estimate the volumetric output of a single-screw extruder operating with the following data:  Screw tip diameter, D= 0.1 m  Average screw height, H = 0.002 m  Average width of pitch, W = 0.05 m  Speed of rotation, N = 6 per second  Angle of helix, θ = 20º  Length of the screw, L = 1.2 m.  The average viscosity of the melt is estimated as 5 Pa. s  The extruder is fed at atmospheric pressure. The pressure at the die is 1.3 MPa, gauge. | CO5 | | E | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the properties of liquids and the unit operations related to them. |
| CO2 | Understand the principles of various unit operations used in food industries. |
| CO3 | Apply the knowledge of unit operations in mechanization of equipment 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** |
| CO1 | 1 | 1 | -- | -- | -- | -- | 2 |
| CO2 | 2 | 0 | -- | -- | -- | -- | 2 |
| CO3 | 7 | 1 | -- | -- | -- | -- | 8 |
| CO4 | 4 | 7 | -- | -- | 6 | 3 | 20 |
| CO5 | 6 | 13 | 9 | 6 | 21 | 6 | 61 |
| CO6 | 6 | 7 | 9 | 3 |  | 6 | 31 |
|  | | | | | | | **124** |

**Graphical user interface, application

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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** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | | Recall the objective of milling. | | CO1 | U | | 1 |
| 2. | | State the changes that occur during gelatinization of paddy. | | CO1 | An | | 1 |
| 3. | | Recall the forces applied during dehulling of paddy in rubber roll sheller. | | CO2 | R | | 1 |
| 4. | | Give an example for continuous flow mixing type flow drier. | | CO1 | R | | 1 |
| 5. | | State the disadvantages of wet milling method of pulses. | | CO3 | U | | 1 |
| 6. | | List any two dhal milling machines. | | CO5 | R | | 1 |
| 7. | | State the composition of corn. | | CO1 | R | | 1 |
| 8. | | Describe cold pressed oil. | | CO3 | U | | 1 |
| 9. | | Recall the millet that has highest percent of calcium among other millets. | | CO1 | R | | 1 |
| 10. | | Which year is declared as International Year of Millets in March, 2021? | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | | Sketch the layout of modern rice milling unit. | | CO6 | | C | 3 |
| 12. | | Sketch the break rollers and reduction rollers and appraise their importance. | | CO6 | | C | 3 |
| 13. | | Recall the process of traditional dry milling of pulses. | | CO3 | | R | 3 |
| 14. | | List any six oil seeds used for extraction of edible oils. | | CO1 | | R | 3 |
| 15. | | Define refining and list any four undesirable constituents removed during refining of vegetable oils. | | CO3 | | An | 3 |
| 16. | | Recall the major and minor millets grown in India. | | 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. | | Indicate the advantages and disadvantages of parboiling of rice. | CO1 | | U | 6 |
|  | b. | | Recall the utilization of byproducts of rice milling industry. | CO2 | | R | 6 |
|  |  | |  |  | |  |  |
| 18. | a. | | Explain the unit operations and milling equipment/machineries used in converting raw wheat into wheat flour. | CO5 | | E | 12 |
|  |  | |  |  | |  |  |
| 19. | a. | | Explain the working of Rotary dryer. | CO1 | | U | 6 |
|  | b. | | Explain working of vertical cone abrasive polisher with a neat figure. | CO2 | | U | 6 |
|  |  | |  |  | |  |  |
| 20. | a. | | Write the flow chart for wet milling of corn. | CO3 | | A | 6 |
|  | b. | | Explain dry milling of corn in detail. | CO3 | | A | 6 |
|  |  | |  |  | |  |  |
| 21. | a. | | Explain the different types of mechanical oil expellers. | CO5 | | E | 8 |
|  | b. | | Differentiate medium fat soy flour and defatted soy flour | CO3 | | An | 4 |
|  |  | |  |  | |  |  |
| 22. | a. | | Appraise the working of LSU dryer. | CO1 | | U | 6 |
|  | b. | | List any four soybean-based products and illustrate the production of any two products. | CO3 | | U | 6 |
|  |  | |  |  | |  |  |
| 23. | a. | | Elaborate the CFTRI method of pulse milling with its merits and demerits. | CO5 | | An | 6 |
|  | b. | | Explain in detail the extraction of oil using solvent extraction method. | CO6 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | a. | | Discuss the pearl millet processing and the value-added products manufactured using the pearl millet. | CO4 | | A | 6 |
|  | 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. | CO4 | | An | 6 |

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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 | 6 | 19 | - | 1 | - | - | 26 |
| CO2 | 7 | 6 | - | - | - | - | 13 |
| CO3 | 3 | 8 | 12 | 7 | - | - | 30 |
| CO4 | 4 | - | 6 | 6 | - | - | 16 |
| CO5 | 1 | - | - | 6 | 20 |  | 27 |
| CO6 | - | 6 | - | - | - | 6 | 12 |
|  | | | | | | | **124** |

**Graphical user interface, application

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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** | **Course Outcome / Bloom’s level** | | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | \_\_\_\_\_packaging that utilizes a technology that keeps food fresh without refrigeration for extended periods  a. Aseptic Packaging b. LDPE c. Nano Packaging d. None of the above | CO1/ An | | | 1 |
| 2. | Example for Class I preservative is \_\_\_  a. Sugar b. Vinegar c. Benzoic acid d. Both a and b | CO1 / R | | | 1 |
| 3. | Which of the following is the major role for industry  a. GMP Compliance b. Product recall system  c. Customer service d. All the above | CO2/A | | | 1 |
| 4. | \_\_\_\_ standardization mark is present in pulses and vegetables  a. IS b. FPO c. AGMARK d. MFPO | CO2/R | | | 1 |
| 5. | AQL means  a. Acceptance Quality Level b. Acceptance Quality limit c. Average Quality level d. Average Quality Limit | CO3/R | | | 1 |
| 6. | \_\_\_ can be used to monitor a laboratory`s test result for validity  a. Certified reference material b. Proficiency testing  c. Retesting d. All the above | CO3 /An | | | 1 |
| 7. | The main purpose of hazard identification is  a. To minimize the effect of a consequence b. For better risk management c. To characterize the adverse effect of toxins d.To reduce the probability of occurrence | CO4/An | | | 1 |
| 8. | The objective of risk assessment is  a. To Evaluate hazard and minimize the risk b. Hazard management c. Remediation of contaminated sites d. To know the source of pollutants | CO4/R | | | 1 |
| 9. | The headquarters of FAO is in \_\_\_\_\_  a. Geneva b. Rome c. London d. Paris | CO5 /R | | | 1 |
| 10. | \_\_\_ is the objective of WHO  a. Increase profit  b. The attainment by all peoples of the highest possible level of health c. Safety of foods d. All the above | CO5/An | | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Define cross contamination. | | CO 1/ R | 3 | |
| 12. | Demonstrate the action rendered to be an offences and penalties under FSSAI act. | | CO 2/AP | 3 | |
| 13. | Identify the quality attributes in defining quality of foods. | | CO 3/An | 3 | |
| 14. | List the seven principles of HACCP. | | CO 4 / U | 3 | |
| 15. | Recognize the function of WTO. | | CO 5/ R | 3 | |
| 16. | Describe the role of codex contact point. | | CO 6/ R | 3 | |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Summarize the different types of food contamination and point out the ways to minimize the risk of contaminations in food. | CO1/ C | 12 |
|  |  |  |  |  |
| 18. | a. | Show the responsibilities of Food Business Operators. | CO2 /A | 10 |
| b. | List the considerations to be made by the adjudicating officer while adjudging the quantum of penalties. | CO2 /R | 2 |
|  |  |  |  |  |
| 19. | a. | Categorize the testing procedures in determining the water quality. | CO3/An | 10 |
| b. | State Food Labelling. | CO3 /R | 2 |
|  |  |  |  |  |
| 20. | a. | Outline the benefits of ISO:22000. | CO4/ An | 6 |
| b. | Generalized the principles in microbial risk assessment. | CO4/ U | 6 |
|  |  |  |  |  |
| 21. | a. | Explain the functions of WTO. | CO5 / U | 6 |
| b. | Remember the objectives of SPS. | CO5/ R | 6 |
|  |  |  |  |  |
| 22. | a. | List the food labelling requirements. | CO3/ R | 8 |
| b. | Differentiate ISO:22000 and HACCP. | CO4 /A | 4 |
|  |  |  |  |  |
| 23. | a. | Show the components involved in microbial risk analysis. | CO3/ A | 6 |
| b. | Analyze the role of food additives. | CO1/An | 6 |
|  |  | **Compulsory:** | | |
| 24. | a. | Outline the core functions and responsibilities of national codex committee. | CO6 /An | 8 |
| b. | Show the functions of shadow committee. | CO6/An | 4 |

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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 Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | - | - | 7 | - | 12 | 23 |
| CO2 | 3 | - | 14 | - | - | - | 17 |
| CO3 | 11 | - | 6 | 14 | - | - | 31 |
| CO4 | 1 | 9 | 4 | 7 | - | - | 21 |
| CO5 | 10 | 6 | - | 1 | - | - | 17 |
| CO6 | 3 | - | - | 12 | - | - | 15 |
|  | | | | | | | **124** |



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| **Course Code** | **20FP3001** | **Duration** | **3hrs** |
| **Course Name** | **MASS TRANSFER AND SEPARATION TECHNIQUES**  **IN FOOD PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **((Answer any five from the following))** | | | | | |
| 1. | a. | Define Molecular Diffusion. Enlist the similarities between Mass transfer and Heat transfer. | CO1 | U | 8 |
|  | b. | The gas hydrogen at 17°C and 0.010 atm partial pressure is diffusing through a membrane of vulcanized neoprene rubber 0.5 mm thick. The pressure of H**2** on the other side of the neoprene is zero. Calculate the steady-state flux, assuming that the only resistance to diffusion is in the membrane. The solubility S of H**2** gas in neoprene at 17°C is 0.051 m**3** (at STP of 0°C and 1 atm)/m**3** solid · atm and the diffusivity D**AB** is 1.03 × 10**−10** m**2**/s at 17°C. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 2. | a. | Define interphase mass transfer and also explain the equilibrium between phases with the help of suitable examples. | CO2 | U | 8 |
|  | b. | Explain the concept of material balance. In the concentration of orange juice, a freshly extracted and strained juice containing 7.08 wt % solids is fed to a vacuum evaporator. In the evaporator, water is removed and the solids content increased to 58 wt % solids. For 1000 kg/h entering, calculate the amounts of the outlet streams of concentrated juice and water. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the factors which are important for evaporation process. | CO3 | C | 8 |
|  | b. | Classify distillation process. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Explain the concept of Boiling point Diagram with the help of an example. | CO4 | R | 8 |
|  | b. | Differentiate between forward feed and backward feed evaporators. | CO4 | An | 8 |
|  |  |  |  |  |  |
| 5. | a. | Describe Leaching principle and equipments. | CO5 | R | 8 |
|  | b. | Explain Super critical Fluid extraction. | CO5 | R | 8 |
|  |  |  |  |  |  |
| 6. | a. | Differentiate between ideal and non ideal solutions. | CO3 | An | 8 |
|  | b. | Explain the working of bubble column. | CO3 | R | 8 |
|  |  |  |  |  |  |
| 7. | a. | Describe separation process by cenrtrifugation. | CO4 | U | 8 |
|  | b. | Summarize filtration process in mass transfer. | CO3 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 8. |  | Explain the process of separation by membranes. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the principles of various mass transfer and separation processes. | | | | | | | |
| CO2 | Express the various mass transfer and separation processes. | | | | | | | |
| CO3 | Describe the types of separation processes in food engineering | | | | | | | |
| CO4 | Calculate the material balance in food processing units. | | | | | | | |
| CO5 | Appraise the performance of processing unit operations | | | | | | | |
| CO6 | Provide solutions to the issues in food processing operations | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | -- | 16 | -- | -- | -- | -- | 16 |
| CO2 | | -- | 16 | -- | -- | -- | -- | 16 |
| CO3 | | 8 | 16 | -- | 8 | -- | 8 | 40 |
| CO4 | | 8 | 8 | -- | 8 | -- | -- | 24 |
| CO5 | | 16 | -- | -- | -- | -- | -- | 16 |
| CO6 | | -- | 20 | -- | -- | -- | -- | 20 |
|  | | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain in detail the olfactory perception theory. | CO2 | A | 8 |
|  | b. | Generalize the concept of Tristimulus colour value of foods. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 2. | a. | Illustrate the microwave assisted extraction of colours. | CO5 | An | 8 |
|  | b. | Propose the biotechnological process for the production of flavor compounds using a flow chart. | CO5 | C | 8 |
|  |  |  |  |  |  |
| 3. | a. | Examine the process of annatto extraction and write the applications of annatto in food applications | CO5 | A | 8 |
|  | b. | List the parameters that affect the color stability. | CO3 | R | 8 |
|  |  |  |  |  |  |
| 4. | a. | Appraise the head space analysis technique for the identification of the volatile compounds in foods. | CO6 | E | 16 |
|  |  |  |  |  |  |
| 5. | a. | Discuss in detail the encapsulation of food flavorings and colorants. | CO5 | U | 16 |
|  |  |  |  |  |  |
| 6. | a. | Prioritize the need for SCFE of food flavorings. | CO5 | An | 8 |
|  | b. | Assess the role of flavor potentiators and risk associated with it. | CO1 | E | 8 |
|  |  |  |  |  |  |
| 7. | a. | Express the significance of e -nose technique in sensing flavor compounds. | CO6 | C | 8 |
|  | b. | Indicate the role of natural and artificial flavors in foods. | CO1 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Compile the various steps involved in sensory evaluation of foods. | CO4 | C | 10 |
|  | b. | Explain the descriptive and discrimination testing in sensory evaluation. | CO4 | A | 10 |

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|  | **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 flavourants and colourants. |
| CO5 | Develop a new range of flavourants 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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 8 |  |  | 8 |  | 16 |
| CO2 |  | 8 | 8 |  |  |  | 16 |
| CO3 | 8 |  |  |  |  |  | 8 |
| CO4 |  |  | 10 |  |  | 10 | 20 |
| CO5 |  | 16 | 8 | 16 |  | 8 | 48 |
| CO6 |  |  |  |  | 16 | 8 | 24 |
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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.** | **Sub Div.** | | **Questions** | **Course Outcome / Bloom’s level** | **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. | Illustrate all the common adulterants occurring in various food commodities. | | CO2 / An | | 8 |
|  |  |  | |  | |  |
| 2. | a. | Draw and Explain the organizational structure of FSSAI. | | CO3 / R | | 8 |
|  | b. | Mr. John wants to start a new food industry, suggest him procedure to obtain the license from FSSAI. | | CO4 / U | | 8 |
|  |  |  | |  | |  |
| 3. | a. | Enlist and explain all the principles of HACCP in a logical sequence. | | CO5 / U | | 8 |
|  | b. | Describe all needs and purpose of sensory evaluation. | | CO4 / U | | 8 |
|  |  |  | |  | |  |
| 4. | a. | Explain the PDCA cycle for implementing the ISO 22000:2018 standards. | | CO5 / U | | 8 |
|  | b. | Describe in detail clause 7 of ISO 22000:2018. | | CO5 / U | | 8 |
|  |  |  | |  | |  |
| 5. | a. | Explain in detail the functioning and responsibilities of FAO. | | CO3 / R | | 8 |
|  | b. | Explain the operational structure of WHO and explain the responsibilities. | | CO1 / R | | 8 |
|  |  |  | |  | |  |
| 6. | a. | Summarize requirements of the sensory evaluation. | | CO1 / U | | 8 |
|  | b. | Explain offences and penalties for food fraud as per FSSAI | | CO3 / R | | 8 |
|  |  |  | |  | |  |
| 7. | a. | Enlist the labeling regulation as per guidelines prescribed by FSSAI. | | CO3 / U | | 8 |
|  | b. | Suggest the packaging material for milk and milk products as per the schedule 4 of FSSAI. | | CO3 / A | | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | |
| 8. |  | Give a detailed study on all the auditable clauses of ISO 22000:2018 applicable to food industry. | | CO6 / C | 20 | |

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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 Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 8 | - | - | - | - | 16 |
| CO2 | - | 8 | - | 8 | - | - | 16 |
| CO3 | 24 | 8 | 8 | - | - | - | 40 |
| CO4 | - | 16 | - | - | - | - | 16 |
| CO5 | - | 24 | - | -- | - | - | 24 |
| 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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Summarize various mechanisms involved in the separation of mixtures in chromatography techniques. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | State the advantages of HPLC over other chromatographic techniques. | CO1 | R | 6 |
|  | b. | Demonstrate the working of FID and TCD detector used in Gas chromatography with a neat diagram. | CO1 | A | 14 |
|  |  |  |  |  |  |
| 3. | a. | Explain with a neat sketch the components and functions of IR spectrophotometer. | CO2 | U | 15 |
|  | b. | State the applications of FTIR. | CO2 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Demonstrate the working principle of Atomic Emission Spectroscopy with a neat sketch. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. | a. | Discuss in detail the working principle of mass spectrometer with neat sketch. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compile native and denatured PAGE electrophoresis for the prediction of molecular weight of the protein with neat sketch. | CO5 | C | 20 |
|  |  |  |  |  |  |
| 7. | a. | Summarize various methods of excitation in atomic emission Spectroscopy. | CO3 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | State the limitations of NMR in terms of spin quantum number. | CO4 | R | 5 |
|  | b. | Summarize 1H and 13C NMR for the prediction of molecular structure. | CO4 | U | 15 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the instrumentation and applications of water activity meter and texture analyzer. | CO6 | U | 20 |

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|  | **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 | 6 | 20 | 14 |  |  |  | 40 |
| CO2 | 5 | 15 |  |  |  |  | 20 |
| CO3 |  |  | 20 |  | 20 |  | 40 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 | 5 | 15 |  |  |  | 20 | 40 |
| CO6 |  | 20 |  |  |  |  | 20 |
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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** | | **Course Outcome** | | **Bloom’s Level** | | **Marks** | |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | | | | |
| 1. | a | Illustrate the importance of ferrous metals and their alloys as materials of construction in process equipment design. | | A | | CO2 | | 8 |
| b | Summarize the mechanical properties of the materials with stress-strain diagram. | | E | | CO1 | | 8 |
| 2. | a | Explain various pressures to be considered in the design of head for pressure vessels. | | An | | CO4 | | 8 |
| b | State the type and application of different types of nozzle in detail. | | R | | CO4 | | 8 |
| 3. | 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? | | E | | CO3 | | 10 |
| b | Show the expression for heat transfer rate through two composite walls connected in series with thermal conductivity k1, k2 and thickness x1 and x2. | | A | | CO2 | | 6 |
| 4. | a | It is proposed to operate a batch reactor for converting A into R. This is a liquid phase reaction with the stoichiometry A gives R. Find the time required to drop the concentration of A from CAo= 1.3 mol/l to CAf=0.30 mol/l ?The rate v/s concentration data are as given below :   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | CA, (mol/l) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | 1.3 | 2.0 | | -rA, (mol/l.min) | 0.1 | 0.3 | 0.5 | 0.6 | 0.5 | 0.25 | 0.10 | 0.06 | 0.05 | 0.045 | 0.042 | | | An | | CO4 | | 8 |
| b | Classify reactors on the mode of operation and get the design equation for FPR. | | U | | CO3 | | 8 |
| 5. | a | Calculate the heat transfer coefficient for fluid flowing through a tube having inside diameter 40 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. | | A | | CO5 | | 10 |
|  | b | Summarise LMTD and the correction factor for LMTD. | | U | | CO4 | | 6 |
| 6 | 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). | | C | | CO1 | | 8 |
| b | Discuss in detail the importance of overall heat transfer coefficient and derive the expression for the same. | | U | | CO2 | | 8 |
| 7 | a | A 2 cm thick steel pipe (thermal conductivity 43 W/[m °C]) with 6 cm inside diameter is being used to convey steam from a boiler to process equipment for a distance of 40 m. The inside pipe surface temperature is 115°C, and the outside pipe surface temperature is 90°C. Calculate the total heat loss to the surroundings under steady-state conditions. | | A | | CO1 | | 10 |
|  | b | Reproduce the design equation for Continuous Stirred Tank Reactor. | | R | | CO4 | | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | | | |
| 8. |  | 1000 kg (dry mass) of non-porous solid is dried under constant drying conditions with an air velocity of 0.75 m/s. The area of the drying surface is 55 m2. If the initial rate of drying is 0.3 g/m2s, how long will it take to dry a material from 0.15 to 0.025 kg water/kg dry solid? The critical moisture content is 0.125 kg water/kg dry solid. Assume that the falling rate is linear. The equilibrium moisture content may be assumed to be zero. If the air velocity is increased to 4 m/s, what will be the anticipated saving in drying time? Assume that the rate of evaporation in a constant rate period is proportional to the air velocity raised to the power of 0.8. | | A | | CO6 | | 20 | |

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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. | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | |  |  | 10 |  | 8 | 8 | 26 |
| CO2 | |  | 8 | 14 |  |  |  | 22 |
| CO3 | |  | 8 |  |  | 10 |  | 18 |
| CO4 | | 14 | 6 |  | 16 |  |  | 36 |
| CO5 | |  |  | 10 |  |  |  | 10 |
| CO6 | |  |  | 20 |  |  |  | 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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the importance of high temperature processing of foods and explain the principle in detail. | CO1 | Ap | 10 |
|  | b. | Summarize the different methods used for thermal process time calculation. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Analyze the theory of freezing with a diagram. | CO2 | An | 6 |
|  | b. | Illustrate a neat schematic diagram of freeze dryer and explain its working. | CO2 | U | 14 |
|  |  |  |  |  |  |
| 3. |  | Interpret the importance of drying of foods and explain heat pump drying with neat schematic diagram. | CO3 | Ap | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Compose the delivery mechanism of bioactive lipids and proteins in detail. | CO4 | C | 20 |
|  |  |  |  |  |  |
| 5. |  | Formulate the method for encapsulation of functional foods. | CO5 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain about spray drying system in detail. | CO3 | An | 12 |
|  | b. | Select the design aspects of spray dryers. | CO3 | An | 8 |
|  |  |  |  |  |  |
| 7. |  | Sketch a neat diagram of infrared dryer and explain its working principle. | CO3 | Ap | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Examine the potential health risk of nano foods. | CO4 | Ap | 8 |
|  | b. | Summarize the release pattern of encapsulated materials. | CO5 | E | 12 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Critically analyze the working principle of e-nose. | CO6 | R | 10 |
|  | b. | Discuss the role of bio-catalyst in food processing industries. | 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 | 10 |  | 10 |  |  |  | 20 |
| CO2 |  | 14 |  | 6 |  |  | 20 |
| CO3 |  |  | 40 | 20 |  |  | 60 |
| CO4 |  |  |  |  |  | 20 | 20 |
| CO5 |  |  | 8 |  | 12 | 20 | 40 |
| CO6 | 10 |  |  |  | 10 |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FP3011** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN DAIRY, MEAT AND FISH PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Summarize the various constituents of milk. | CO3 | E | 12 |
|  | b. | Enlist the factors affecting the composition of milk. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 2. | a. | Discuss the factors determining the selection of milk transportation methods. | CO1 | U | 8 |
|  | b. | Describe the methods of milk transportation. | CO1 | R | 8 |
|  |  |  |  |  |  |
| 3. |  | Illustrate the physico-chemical characteristics of milk. | CO3 | Ap | 16 |
|  |  |  |  |  |  |
| 4. |  | Describe the process of high-temperature long-time (HTST) pasteurization with neat flow diagram. | CO5 | R | 16 |
|  |  |  |  |  |  |
| 5. |  | Illustrate in detail about milk reception tests followed in dairy  processing industries. | CO6 | Ap | 16 |
|  |  |  |  |  |  |
| 6. | a. | Explain in detail about the unit operations involved in canning of  fish. | CO2 | U | 8 |
|  | b. | Summarize the main layers of meat muscle tissue with neat diagram. | CO4 | E | 8 |
|  |  |  |  |  |  |
| 7. | a. | Explain the steps involved in preparation methods of different types of sausages with process flowchart. | CO2 | A | 8 |
|  | b. | Rewrite the methods of production of fish protein concentrate. | CO3 | C | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Report the principles of HACCP. | CO6 | C | 3 |
|  | b. | Visualize the main components of an modern abattoir with a design of plant layout. | CO5 | U | 17 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the precautions that need to be taken while handling products from this segment. |
| CO2 | Recall the different types of meat, poultry and fish and the processes involved in their processing. |
| CO3 | Analyze the challenges in developing new value-added products from this segment. |
| CO4 | Evaluate the hygienic and safe handling of Meat, Fish and Dairy Products. |
| CO5 | Design the machinery involved in the Meat, Fish and Dairy Products processing segment. |
| CO6 | Create solutions for quality checks involved in Meat, Fish and Dairy Products processing segment. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 12 |  |  |  |  | 20 |
| CO2 | 8 |  |  | 8 |  |  | 16 |
| CO3 |  |  | 16 |  | 12 | 8 | 36 |
| CO4 |  |  |  |  | 8 |  | 8 |
| CO5 | 16 | 17 |  |  |  |  | 33 |
| CO6 |  |  | 16 |  |  | 3 | 19 |
|  | | | | | | | **132** |



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| **Course Code** | **20FP3014** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN REFRIGERATION AND COLD SUPPLY CHAIN MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | | |
| 1. | |  | Illustrate Vapor compression cycle with T-S and P-V diagram for wet vapor, dry vapor and superheated | CO1 | A | 16 |
|  | |  |  |  |  |  |
| 2. | | a. | Classify air conditioning systems based on various seasons and state their merits and demerits. | CO2 | An | 10 |
| 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 0.35W/ (m·K) so that heat loss per m 2 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. | CO2 | E | 6 |
|  | |  |  |  |  |  |
| 3. | | a. | Summarize the factors to be considered during the calculation of heat load for cold storage design. | CO3 | E | 10 |
| b. | Discuss optimum storage temperature of meat and poultry products. | CO3 | U | 6 |
|  | |  |  |  |  |  |
| 4. | |  | Describe various chilling equipments used and the importance of secondary refrigerants. | CO4 | U | 16 |
|  | |  |  |  |  |  |
| 5. | |  | Discriminate freezing rate and growth rate of crystals in meat products. | CO5 | E | 16 |
|  | |  |  |  |  |  |
| 6. | |  | A cold storage plant is required to store 20 tonnes of fish. The temperature of the fish when supplied = 25°C; storage temperature of fish required = – 8°C; specific heat of fish above freezing point = 2.93 kJ/kg°C; specific heat of fish below freezing point = 1.25 kJ/kg°C. freezing point of fish = – 3°C. Latent heat of fish = 232 kJ/kg. If the cooling is achieved within 8 hours; find out:  (i) Capacity of the refrigerating plant.  (ii) Carnot cycle C.O.P. between these temperature ranges.  (iii) If the actual C.O.P. is 1/3 rd of the Carnot C.O.P. Find out the power required to run the plant. | CO1 | An | 16 |
|  | |  |  |  |  |  |
| 7. | |  | Compare and contrast modified atmospheric packaging and controlled atmospheric storage | CO4 | E | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | |
| 8. | a. | | Reproduce the components of cold chain management | CO6 | R | 10 |
| b. | | Demonstrate the cold chain management practiced in beverages industries | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall refrigeration of food and its operational components. |
| CO2 | Classify various forms of food refrigeration in plants, stores and logistics. |
| CO3 | Apply advanced food freezing concepts and techniques. |
| CO4 | Point out food safety aspects of chilled foods and frozen foods. |
| CO5 | Assess cold chain management in the food distribution sector. |
| CO6 | Develop cold storage and packaging of frozen perishable products |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | --- | --- | 16 | 16 | --- | --- | 32 |
| CO2 | --- | --- | --- | 10 | 6 | --- | 16 |
| CO3 | --- | 6 | --- | --- | 10 | --- | 16 |
| CO4 | --- | 16 | --- | --- | 16 | --- | 32 |
| CO5 | --- | --- | --- | --- | 16 | --- | 16 |
| CO6 | 10 | --- | 10 | --- | --- | --- | 20 |
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| **Course Code** | **20FP3017** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCES IN FOOD PACKAGING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain in detail the accelerated shelf-life testing method. | CO 1 | U | 8 |
|  | b. | Illustrate the functions and basic requirements of the packaging. | CO 2 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Assume you are the trained personnel in an *XYZ* Packaging industry if the industry wants to manufacture glass containers for the foods, in that case, draw your considerations about glass containers. | CO 3 | A | 8 |
|  | b. | Discuss the applications of plastics, copolymers, extruded films, and laminates. | CO 3 | A | 8 |
|  |  |  |  |  |  |
| 3. | a. | List antimicrobial agents and describe active antimicrobial packaging. | CO 6 | An | 8 |
|  | b. | Elaborate Controlled release Packaging and Oxygen scavenging mechanisms | CO 6 | C | 8 |
|  |  |  |  |  |  |
| 4. | a. | Develop packaging strategies for eco-designing of the food packaging system. | CO 6 | C | 8 |
|  | b. | Draw a simplified flow chart of the food packaging system with emphasis on food and packaging waste production. | CO 4 | U | 4 |
|  | c. | Explain the sustainable packaging as defined by the Australian-based Sustainable Packaging Alliance (SPA). | CO 4 | U | 4 |
|  |  |  |  |  |  |
| 5. | a. | Elaborate on the principle and applications of RFID tags. | CO 6 | U | 8 |
|  | b. | Elaborate on the principle and advantages of MAP. | CO 6 | U | 4 |
|  | c | Elaborate on the principle of freshness and safety indicators used in food packaging and the advances in freshness and safety indicators. | CO 6 | U | 4 |
|  |  |  |  |  |  |
| 6. | a. | Explain the effect of environmental factors and biological factors on the quality of food products. | CO 2 | U | 8 |
|  | b. | Explain vacuum and inert gas packaging. | CO 6 | U | 8 |
|  |  |  |  |  |  |
| 7. |  | Appraise all the test methods used for testing packaging materials. | CO 5 | E | 16 |
|  | **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | |
| 8. | a. | Explain the types of migration and mechanisms of migration in the packed foods. | CO 5 | E | 10 |
|  | b. | List the factors affecting migration in the packed foods and classify the migrating substances according to the type of the packaging material. | CO 3 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge on shelf life of food and various methods of estimating it. |
| CO2 | Understand the need and functions of packaging as a solution to various factors affecting food. |
| CO3 | Apply their knowledge of packaging materials to pick the right material for packaging of foods. |
| CO4 | Analyze the packages for their Life Cycle. |
| CO5 | Evaluate selection of test methods for packaging materials. |
| CO6 | Devise innovations in eco-packaging designs for food systems. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 8 | - | - | - | - | 8 |
| CO2 | 8 | 8 | - | - | - | - | 16 |
| CO3 | - | - | 16 | 10 | - | - | 26 |
| CO4 | - | 8 | - | - | - | - | 8 |
| CO5 | - | - | - | - | 26 | - | 26 |
| CO6 | - | 24 | - | 8 | - | 16 | 48 |
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| **Course Code** | **20FP3022** | **Duration** | **3hrs** |
| **Course Name** | **FOOD SUPPLY CHAIN MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the reasons for the increased importance of logistics. | CO1 | U | 8 |
|  | b. | Explain in detail the economic utilities. | CO1 | U | 8 |
| 2. |  | Define Six Sigma and explain the factors and challenges of Six Sigma. | CO2 | An | 16 |
| 3. |  | Explain the role and challenges of logistics and supply chain management in the food industry. | CO3 | E | 16 |
| 4. |  | Discuss the import and export protocols and write the SOP for the export and import of vegetables. | CO4 | An | 16 |
| 5. | a. | Explain the various modes of transportation and distribution channels with a neat figure. | CO5 | C | 8 |
|  | b. | Elaborate on strategic sourcing. | CO5 | U | 8 |
| 6. | a. | Explain inventory management models and control techniques. | CO6 | An | 8 |
|  | b. | Elaborate on the types of performance metrics used in the food supply chain. | CO6 | E | 8 |
| 7. | a. | Illustrate internal and external supply chain risks. | CO3 | E | 8 |
|  | b. | Illustrate supply chain risk management strategies. | CO3 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | List elements of a cold chain, and operational conditions of cold chain logistics and show how the various technologies closely interact in a sequential manner to support a cold chain. | CO6 | C | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Learn the methods of logistics. |
| CO2 | Understand the concepts of supply chain management. |
| CO3 | Identify challenges of food retailing as well as international food supply chains. |
| CO4 | Empower the students in the field of logistics and supply chain management. |
| CO5 | Design logistics and supply chain management for food industries. |
| CO6 | Apply Methods and Tools for creating sustainable supply chains. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 16 | - | - | - | - | 16 |
| CO2 | - | - | - | 16 | - | - | 16 |
| CO3 | - | - | - | - | 32 | - | 32 |
| CO4 | - | - | - | 16 | - | - | 16 |
| CO5 | - | 8 | - | - | - | 8 | 16 |
| CO6 | - | - | - | 8 | 8 | 20 | 32 |
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| **Course Code** | **20FT3008** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF PLANTATION CROPS AND SPICES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the cup characteristics of *C. arabica* and *C. robusta* coffee. | CO3 | E | 10 |
|  | b. | Discuss the biochemical changes that take place during roasting of coffee beans. | CO1 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Demonstrate the dry processing method of green coffee with a flow diagram. | CO2 | U | 10 |
|  | b. | Illustrate the process of decaffeination of green coffee with comparison to water, organic solvents and carbon dioxide. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the quality specifications and chemical composition of turmeric. | CO1 | E | 10 |
|  | b. | Elaborate the processing steps involved in primary and secondary products of ginger. | CO 4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | With a neat flow diagram, explain the steps involved in instant tea production. | CO3 | An | 10 |
|  | b. | Analyze the biochemical changes that take place during withering and fermentation of tea leaves. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the steps involved in cinnamon processing. | CO4 | E | 10 |
|  | b. | Discuss the production methods of cocoa butter and cocoa powder. | CO6 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Enumerate the adulterants and possible contaminants on post harvest processing of coriander. | CO1 | An | 10 |
|  | b. | Categorize the quality specifications for cumin seeds, powder and volatile oil. | CO5 | E | 10 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the flow chart for cardamom processing and explain drying methods. | CO4 | U | 10 |
|  | b. | Elaborate the steps involved in the garlic dehydration process with flowchart. | CO4 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the post harvest technology and quality specifications of black and white pepper. | CO2 | U | 10 |
|  | b. | Illustrate the methods and production of oleoresin from major spices. | CO 5 | U | 10 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Demonstrate the roasting methods used for cashew nut. | CO2 | U | 10 |
|  | b. | Discuss extraction of cashew nut shell liquid. | CO6 | C | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the chemistry of plantation crops and spice crop 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 crops 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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | - | 20 | 10 | 10 | 40 |
| CO2 | - | 30 | - | - | - | - | 30 |
| CO3 | - | 10 | - | - | 10 | - | 20 |
| CO4 | - | 20 | - | - | 10 | 10 | 40 |
| CO5 | - | 10 | - | - | 10 | - | 20 |
| CO6 | - | 10 | - | - | - | 10 | 30 |
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| **Course Code** | **20FT3009** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF MEAT, POULTRY AND FISH PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the fat composition and its modifiers. | CO1 | U | 10 |
|  | b. | Draw the diagram showing the various bands and zone in a sarcomere and also explain them. | CO1 | Ap | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Summarize ante mortem inspection and handling of meat animals. | CO2 | U | 10 |
|  | b. | Explain stunning methods in brief. | CO2 | U | 10 |
| 3. | a. | Explain seven principles of HACCP with the help of suitable example. | CO3 | U | 10 |
|  | b. | Discuss canned meat and cured meat products with examples. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the Processing operations for poultry. | CO4 | U | 10 |
|  | b. | Discuss the composition and nutritional value of poultry meat. | CO4 | U | 10 |
| 5. | a. | Explain microbial spoilage of egg and egg; products. | CO5 | U | 10 |
|  | b. | Explain the preparation of egg products. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe buffalo dressing operations. | CO3 | U | 10 |
|  | b. | Discuss post mortem muscle chemistry. | CO3 | U | 10 |
| 7. | a. | Summarize packaging of poultry. | CO4 | U | 10 |
|  | b. | Discuss post mortem muscle chemistry. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain By-product Utilization. | CO6 | U | 10 |
|  | b. | Discuss fish processing operations. | CO6 | U | 10 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Report the spoilage factors of fish. | CO6 | U | 10 |
|  | b. | Explain the Grading of Marine Foods. | CO6 | U | 10 |

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

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Gut is the second brain, and a proper gut health is necessary for a proper wellbeing – Justify the statement. | CO3 | An | 10 |
|  | b. | Water soluble compounds don’t reach the brain due to certain reasons – Can you discuss the reasons for the same? | CO3 | A | 10 |
|  |  | (OR) |  |  |  |
| 2. | a. | Briefly outline the Up- and – Down method of determining acute toxicity with its pros and cons. | CO5 | An | 10 |
|  | b. | A Food company wants your clarification on a. NOAEL b. ADI. Can you help them? | CO4 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | AA needs clarification on the likely modes of exposure of toxins. Can you briefly explain the same? | CO6 | An | 10 |
|  | b. | Briefly outline the methods for testing a. Teratogenicity b. Carcinogenicity. | CO6 | A | 2x5 = 10 |
|  |  | (OR) |  |  |  |
| 4. |  | Outline the tests carried out for determining the chronic toxicity of a substance. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. | a. | Briefly discuss the general rules observed for predicting the Phase I biotransformation reactions. | CO3 | A | 10 |
|  | b. | Cytochrome P450 group of enzymes play a major role in xenobiotic biotransformations – Justify. | CO4 | A | 10 |
|  |  | (OR) |  |  |  |
| 6. | 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 |
|  |  |  |  |  |  |
| 7. | 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 |
|  |  | (OR) |  |  |  |
| 8. |  | Discuss briefly on the following – a. Goiterogens b. Protease inhibitors c. Lathyrogens d. Ochratoxin | CO1 | A | 4X5 = 20 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss briefly on the following –  (i)Heavy metal toxicity (ii) Pesticide residues and health effects. | CO 2 | A | 2x10 = 20 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 10+10+20 | 10 |  |  | 50 |
| CO2 |  |  | 20 |  |  |  | 20 |
| CO3 |  |  | 10+10+20 |  |  |  | 40 |
| CO4 |  |  | 10+10+10 |  |  |  | 30 |
| CO5 |  |  | 10 | 10 |  |  | 20 |
| CO6 |  |  |  | 10 | 10 |  | 20 |
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| **Course Code** | **20FT3015** | **Duration :** | **3hrs** |
| **Course Name** | **FOOD QUALITY SYSTEMS AND MANAGEMENT** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome / Bloom’s Level** | | **Marks** | |
|  |  | **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** |  | |  | |
| 1. | a. | Describe all the PRP for GAP for fresh fruits and vegetables. | CO1 / U | | 10 | |
|  | b. | Explain in detail the requirements of sensory evaluation. | CO1 / U | | 10 | |
| **(OR)** | | | | | | |
| 2. | a. | Explain all the principles of HACCP in chronological order. | CO3 / U | | | 10 |
|  | b. | List all the tools and techniques used for TQM. | CO2 / An | | | 10 |
|  |  |  |  | | |  |
| 3. | a. | Write in brief thefactors affecting food safety. | CO2 / U | | | 10 |
|  | b. | Illustrate all the common adulterants occurring in Food commodities. | CO4 / An | | | 10 |
| **(OR)** | | | | | | |
| 4. | a. | Explain the operational structure of FAO. | | CO6 / U | 10 | |
|  | b. | Explain in detail the functioning and responsibilities of WHO. | | CO6 / R | 10 | |
|  |  |  | |  |  | |
| 5. | a. | Explain the provisions made under FSSAI Act 2006. | | CO5 / U | 10 | |
|  | b. | Describe the process for obtaining the license to start a new food business in India as per FSSAI Act 2006. | | CO5 / U | 10 | |
| **(OR)** | | | | | | |
| 6. | a. | Distinguish between QA and QCand write short note on them. | | CO2 / U | 10 | |
|  | b. | Explain GLP and GHP for microbiology lab of a dairy industry. | | CO5 / U | 10 | |
|  |  |  | |  |  | |
| 7. | a. | Draw the flow chart for organizational structure of FSSAI and explain it. | | CO5 / U | 10 | |
|  | b. | Suggest the packaging material for milk and milk products as per schedule 4 of FSSAI. | | CO5 / R | 10 | |
| **(OR)** | | | | | | |
| 8. | a. | Summarize the offences and penalties as per FSSAI Act 2006. | | CO5 / R | 10 | |
|  | b. | Explain all the labeling regulations as per FSSAI 2011. | | CO6 / U | 10 | |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. |  | Give a detailed study on all the auditable clauses of ISO 22000:2018 applicable to food industry. | | CO6 / C | 20 | |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | - | 20 | - | 10 | - | - | 30 |
| CO3 | - | 10 | - | - | - | - | 10 |
| CO4 | - | - | - | 10 | - | - | 10 |
| CO5 | 20 | 40 | - | - | - | - | 60 |
| CO6 | 10 | 20 | - | - |  | 20 | 50 |
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| **Course Code** | **20FT3016** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL METHOD OF ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **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 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 details 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 |

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|  | **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 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Classify antioxidants with example under each category. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the safety and testing aspects of food additives. | CO2 | An | 15 |
|  | b. | Write a short note on E numbers. | CO2 | A | 5 |
|  |  |  |  |  |  |
| 3. |  | Enumerate flavorants based on origin and nature of raw materials with examples. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the mode of action of antimicrobial preservatives. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Write the source, role and mechanism of action of natural colorants in foods. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the role of sweeteners in food industry with an example. | CO2 | An | 12 |
|  | b. | Categorize cheating agents used in food. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 7. |  | Define acidulants. Mention the applications of any four organic acids. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss about the importance of pigments in food industry. | CO6 | U | 12 |
|  | b. | Explain the role of enzymes used in food industry. | CO3 | An | 8 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain role of clarifying agents, antifoaming agents, fat mimetics and replacers used in food industry with examples | CO6 | An | 20 |

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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 | - | 20 | 5 | 27 | - | - | 52 |
| CO3 | 20 | 8 | - | 8 | - | - | 36 |
| CO4 | - | - | - | 20 | - | - | 20 |
| CO5 | - | - | - | - | 20 | - | 20 |
| CO6 | - | 12 | - | 20 | - | - | 32 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Define/explain the following terms in one or two sentences a). Enzyme unit (IU); b) katal; c) Turnover number;  d) Prosthetic groups; e). Substrate; f). Metal ions; g) Active cite; h) Cofactor; i) Proenzyme; j) Enzyme kinetics | CO1 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Summarize the methods of enzymes precipitation. | CO2 | E | 10 |
|  | b. | Illustrate the classification of enzymes based on its catalytic activity. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. |  | Describe the physical and chemical properties of enzymes. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Distinguish the types of enzyme regulation. | CO5 | E | 20 |
|  |  |  |  |  |  |
| 5. | a. | Derive the Michealis-Menten equation of a substrate-enzyme  catalysed reaction. | CO3 | C | 10 |
|  | b. | Rewrite the different various factors affecting the enzyme  Activity. | CO3 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the role of coenzymes and its classification. | CO1 | U | 10 |
|  | b. | Discuss enzyme activation by alkali metal cations, alkaline earth metal cations and transition metal cations. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 7. |  | Visualize the classification and application of lipase enzymes in food processing industries. | CO6 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Write in detail the metalloenzymes. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | State the application of enzymes in fermentation industry. | CO6 | R | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe structure, functions and the mechanisms of action of enzymes |
| CO2 | Understand the enzyme activity in foods. |
| CO3 | Learn kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process. |
| CO4 | Understand immobilization 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** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 10 |  |  |  |  | 30 |
| CO2 |  |  |  | 10 | 10 |  | 20 |
| CO3 |  | 20 |  |  |  | 20 | 40 |
| CO4 |  |  | 10 |  |  |  | 10 |
| CO5 |  |  |  |  | 20 |  | 20 |
| CO6 | 40 |  | 20 |  |  |  | 60 |
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| **Course Code** | **20FT3019** | **Duration** | **3hrs** |
| **Course Name** | **NUTRACEUTICALS AND HEALTH FOODS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Nutraceuticals, Write in detail the chemical constituents of Nutraceuticals. | CO1 | R | 10 |
|  | b. | Write in detail the Non-Traditional Nutraceuticals classification. | CO1 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain in detail the Nutraceutical Enzymes and Probiotic Microorganisms. | CO2 | U | 10 |
|  | b. | Define Antioxidants. List the types and functions of Antioxidants and essential oils as Antioxidants. | CO2 | R | 10 |
| 3. | a. | Explain in detail the Health benefits of Probiotics. | CO4 | Ap | 15 |
|  | b. | Define Synbiotics, Write in detail the synbiotic food products. | CO3 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Define dietary fibre. Explain in detail the classification and sources of dietary fibre. | CO1 | R | 10 |
|  | b. | Distinguish in detail food sources, absorption, metabolism, bioavailability, effect of processing and health benefits of the Carotenoids. | CO2 | E | 10 |
| 5. | a. | Recall definition and classification of phytoestrogens. | CO6 | R | 10 |
|  | b. | Write in detail the health benefits of phytoestrogens. | CO2 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Distinguish solvents commonly used in extraction of bioactive compounds. | CO5 | U | 10 |
|  | b. | Extend general techniques of medicinal plant extraction. | CO3 | U | 10 |
| 7. | a. | Explain in detail the isolation methods of alkaloids, glycosides, phenolics. | CO6 | Ap | 10 |
|  | b. | Summarize Thin layer chromatography, High performance thin layer chromatography, High Performance liquid chromatography, Gas chromatography. | CO6 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain classification of food matrices. | CO5 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Relate nutrigenomics and personalized medicine. | CO3 | Ap | 20 |

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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 | 20 | - | - | - | - | 10 | 30 |
| CO2 | 10 | 10 | - | - | 10 | 10 | 40 |
| CO3 | 5 | 10 | 20 | - | - | - | 35 |
| CO4 | - | - | 15 | - | - | - | 15 |
| CO5 | - | 10 | - | 20 | - | - | 30 |
| CO6 | 10 | - | 10 | - | 10 | - | 30 |
|  | | | | | | | **180** |

Graphical user interface, application

Description automatically generated with medium confidence

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

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain in detail the functions of packaging and the levels of packaging. | CO1 | U | 10 |
|  | b. | Explain in detail the basic requirements of packaging. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the direct and indirect methods of estimation of the shelf life of the food. | CO2 | An | 10 |
|  | b. | Elaborate on the accelerated shelf-life testing method. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the lacquering process and enlist the internal and external metal coating materials used in the coating of food containers. | CO3 | U | 10 |
|  | b. | Enlist types of packaging materials and elaborate on the properties of polymers and glasses. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | List the types of fillers, and sealing machines and explain any two filling and 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 printing techniques used in labeling. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Enlist the types of polymers, papers, and paper boards used in food packaging and explain the applications of aluminum foils and paper boards. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain vacuum and inert gas packaging. | CO6 | U | 10 |
|  | b. | Assume a packaging material is allowing different gases to enter inside it. In that case, recommend different tests that can be employed to measure the gas permeability of that packaging material and explain any one test in detail. | 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. | Assume that you are the trained personnel in an *XYZ* packaging industry if the industry wants to manufacture two-piece containers for the carbonated beverage, in that case, discuss in detail the process steps you will follow. | CO3 | A | 10 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Elaborate on the modified atmosphere packaging and the controlled atmosphere storage. | CO6 | U | 10 |
|  | b. | Elaborate on biodegradable packaging and intelligent packaging. | CO6 | U | 10 |

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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 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 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the challenges involved in waste characterization obtained from food industry. | CO1 | U | 10 |
|  | b. | Enlist purposes of waste characterization. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain all the four phases of bio gas generation along with reactions. | CO2 | U | 10 |
|  | b. | Summarize the major sources of waste from fruits and vegetables  Industries. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write a detailed note on the aerobic compositing methods. | CO3 | R | 10 |
|  | b. | Write a detailed note on the anaerobic compositing methods. Enlist the advantages and disadvantages for anaerobic composting. . | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain trickling filters in detail with its process diagram. | CO4 | R | 10 |
|  | b. | Describe all the properties and their importance involved in waste characterization obtained from food industry. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain activated sludge systems along with diagram. | CO5 | U | 10 |
|  | b. | Draw a diagram for dissolved air flotation (DAF) system and explain its working. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Draw and explain Rotating Biological Contactors (RBC). | CO2 | U | 10 |
|  | b. | Discuss seafood-processing wastewater characterization by its various physiochemical parameters. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Enlist all the possible Number of bio products can be obtained by the processing of the fruit and vegetable skins. | CO4 | An | 10 |
|  | b. | Explain the primary treatment of the waste water obtained from Dairy processing unit. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain Major sources of pollution load in fruit and vegetable processing industries. | CO3 | U | 10 |
|  | b. | Write and explain all the legal provisions for handling the waste generated from urban and peri-urban areas. | CO4 | U | 10 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain a case study along with the calculation for water foot print for the poultry processing unit. | CO6 | C | 20 |

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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 | 10 | 10 | - | - | - | - | 20 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | 10 | 20 | - | - | - | - | 30 |
| CO4 | 10 | 20 | - | 10 | - | - | 40 |
| CO5 | - | 30 | - | - | - | - | 30 |
| CO6 | - | - | - | - | - | 20 | 20 |
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Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **20FT3022** | **Duration** | **3hrs** |
| **Course Name** | **FOOD BIOTECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the tools used and steps involved in rDNA technology | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Recall the different branches and types of biotechnology. | CO1 | R | 10 |
|  | b. | Enumerate the History of biotechnology. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. |  | Describe the manufacturing procedure for Beer. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Recall the Fermentation product and fermenting agent used in its preparation. | CO2 | R | 10 |
|  | b. | Distinguish batch and continuous fermentation. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the application of bacteriocins in variety of food system. | CO4 | R | 10 |
|  | b. | Comment on limitations of Biopreservatives. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Discuss briefly on methods used for detection of food borne pathogens. | CO5 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Write a short note on Plant tissue culture. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Illustrate the application of biotechnology in food. | CO2 | An | 20 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Outline the importance of biosensors in food industry. | CO6 | R | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the application of genetic information of animal and plant species in food. |
| CO2 | Learn the Importance of applications of biotechnology in food. |
| CO3 | Explain the applications of GMO foods. |
| CO4 | Apply the role of bio preservatives in foods. |
| CO5 | Evaluate the application of molecular techniques in characterization food borne pathogens. |
| CO6 | Apply biosensors in foods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 20 | - | - | - | - | 40 |
| CO2 | 10 | 30 | - | 20 | - | - | 60 |
| CO3 | - | - | 20 | - | - | - | 20 |
| CO4 | 10 | 10 | - | - | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | 20 | -- | - | - | - | - | 20 |
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| **Course Code** | **22FT3001** | **Duration** | **3hrs** |
| **Course Name** | **FOOD CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define water in food, types, and physical properties of water. | CO1 | R | 10 |
|  | b. | Write in detail about water activity & Sorption Phenomena. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain in detail about the classification of Carbohydrates. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. | a. | Write in detail about the classification of lipids. | CO1 | Ap | 10 |
|  | b. | Explain in detail about chemical properties of lipids. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Recall the classification of Proteins. | CO4 | Ap | 10 |
|  | b. | Discuss in detail about functional properties of proteins. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write in detail about structure, stability, sources, bioavailability, toxicity, reasons for the loss of vitamins in foods, and transportation of Vitamin A. | CO5 | C | 10 |
|  | b. | Write in detail about structure, stability, sources, bioavailability, toxicity, and factors affecting the availability and transportation of Iron. | CO5 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Categorize the classification of pigments, chemistry, applications and sources of anthocyanin and carotenoids. | CO6 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Discuss in detail about modified starch, cellulose and their application in food industry. | CO3 | U | 10 |
|  | b. | Write in detail about Immobilized enzymes, and factors affecting enzyme activity. | CO2 | Ap | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Distinguish about hydrogenation, interesterification and Fat Mimetics. | CO5 | E | 10 |
|  | b. | Recall about the definition and classification of free radicals and antioxidants. | CO6 | R | 10 |
| **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 E and B2. | CO5 | C | 10 |
|  | b. | Explain in detail about structure, stability, sources, bioavailability, toxicity, and factors affecting the availability and transportation of sodium. | CO5 | C | 10 |

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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 analyze 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 | 20 | - | - | 40 |
| CO2 | - | 10 | 10 | - | - | - | 20 |
| CO3 | - | 10 | - | 10 | - | - | 20 |
| CO4 | - | - | 10 | 10 | - | - | 20 |
| CO5 | - | - | - | - | 10 | 40 | 50 |
| CO6 | 10 | - | - | 20 | - | - | 30 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | “Molds of industrial importance”. (i) Examine and interpret the spoilage effect of mold on various food products. | CO1 | R | 10 |
|  | b. | State the beneficial role of any four mold species in the development of fermented products. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the fermentation process of cheese with more emphasis on Microbiology. | CO2 | U | 15 |
|  | b. | Cite the principle of membrane filtration technique. | CO2 | U | 5 |
|  |  |  |  |  |  |
| 3. | a. | Examine the food samples for the following: (i) *Clostridium botulinum infection* (ii) Intoxication (iii) Control measures. | CO3 | A | 15 |
|  | b. | Differentiate exotoxin and endotoxin. Record the mechanism of action of staphylococcal enterotoxin B. | CO3 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Develop a flow diagram of primary and secondary screening of industrially important strains. | CO4 | A | 10 |
|  | b. | Classify preservation methods of industrially important strains. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Prioritize the requirements of wine fermentation with a special mention about the applications and spoilage effects. | CO5 | A | 10 |
|  | b. | Summarize the prerequisites of glutamic acid production. | CO5 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Categorize fermentation media with a special mention about the major ingredients of fermentation media. | CO4 | An | 15 |
|  | b. | Discriminate batch and continuous sterilization. | CO4 | An | 5 |
|  |  |  |  |  |  |
| 7. | a. | Evaluate the role of ELISA in detection of microorganisms found in foods. | CO3 | C | 15 |
|  | b. | Describe the mechanism of action of mycotoxins. | CO3 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Classify filtration process and types of filters used in purification of fermented products. | CO6 | An | 10 |
|  | b. | Illustrate the methods of precipitation. | CO6 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Define downstream processing. Write short notes on the following: (a) cell disruption (b) Centrifugation. | CO6 | C | 20 |

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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 | 20 |  |  |  |  |  | 20 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 5 | 15 | 5 |  | 15 | 40 |
| CO4 |  |  | 10 | 30 |  |  | 40 |
| CO5 |  |  | 10 |  | 10 |  | 20 |
| CO6 |  |  | 10 | 10 |  | 20 | 40 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Enumerate the types of foods based on water activity and pH. | CO1 | R | 8 |
|  | b. | State the three different mechanism of spoilage of foods. | CO1 | R | 12 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the types of blanching of fruits and vegetables. | CO2 | U | 10 |
|  | b. | Classify pasteurization methods with suitable examples. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Categorize the methods of freezing with a special highlight about the effect of freezing on fruits and vegetables. | CO3 | An | 15 |
|  | b. | Report the freeze thaw stability of foods. | CO3 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write the working principle of Freeze drier with a diagrammatic representation. | CO4 | A | 10 |
|  | b. | Sketch a neat flow diagram of spray drying of liquid foods with a special mention about advantages and disadvantages. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. |  | Explain the mechanism of action of any five preservatives used in foods. | CO5 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Classify the types of drum dryers with a highlight on working principle and advantages. | CO4 | An | 15 |
|  | b. | Criticize the physical and chemical changes observed during drying. | CO4 | C | 5 |
|  |  |  |  |  |  |
| 7. | a. | Explain the following: (i) D value (ii) z value (ii) F value (iv)12D concept | CO2 | R | 12 |
|  | b. | Appraise the effect of fluidized bed drying on foods. | CO4 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Prepare a flow chart of high pressure processing of foods with applications. | CO6 | C | 10 |
|  | b. | Criticize on irradiated foods. Add a note on the mechanism of irradiation in elimination of pathogens. | CO6 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a detailed note on minimally processed fruit and vegetable products. | CO6 | C | 10 |
|  | b. | Define hurdle concept. Summarize the effect of hurdle technology in preservation of fruits. | CO6 | E | 10 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 |  |  |  |  |  | 20 |
| CO2 | 12 | 20 |  |  |  |  | 32 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 |  | 8 | 10 | 25 |  | 5 | 48 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  |  |  | 20 | 20 | 40 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Express with a neat sketch the structure of paddy. | CO1 | C | 10 |
|  | b. | Generalize the composition of pulses. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Establish the methods of wheat parboiling. | CO2 | A | 10 |
|  | b. | Examine alveograph and its related tests on wheat. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Generalize the various products of rice. | CO4 | C | 10 |
|  | b. | Categorize the various whitening and polishing cones used in paddy milling. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Appraise the manufacture of tortillas. | CO2 | E | 10 |
|  | b. | Assess the production of dextrose. | CO4 | E | 10 |
|  |  |  |  |  |  |
| 5. | a. | Express the wet and dry milling methods in pulses. | CO5 | C | 10 |
|  | b. | Interpret the CIAE process of pulse milling. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Appraise the production of High Fructose Corn Syrup from maize. | CO4 | An | 10 |
|  | b. | Illustrate the effect of parboiling on milling, nutritional and cooking qualities of paddy. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Calculate the critical speed and operating speed in rpm of rotation for:  i)wet grinding in viscous suspension by a ball mill of 1600 mm diameter charged with 75 mm balls  ii) solid grinding by a ball mill of 2000 mm diameter charged with 100 mm balls. | CO2 | An | 10 |
|  | b. | Illustrate the manufacture of corn flakes. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the under-runner disk huller with its working principle. | CO6 | An | 10 |
|  | b. | Recognize the various unit operations involved in pulse milling. | CO2 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Examine the various oil extraction methods. | CO1 | R | 10 |
|  | b. | Describe the recent evolution in oil processing. | CO2 | R | 10 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  | 10 | 30 |
| CO2 | 20 |  | 20 | 20 | 10 |  | 70 |
| CO3 |  |  | 10 |  |  |  | 10 |
| CO4 |  | 10 |  | 10 | 10 | 10 | 40 |
| CO5 |  | 10 |  |  |  | 10 | 20 |
| CO6 |  |  |  | 10 |  |  | 10 |
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| **Course Code** | **22FT3005** | **Duration** | **3hrs** |
| **Course Name** | **TECHNOLOGY OF FRUITS AND VEGETABLE PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Summarize SWOT analysis for fruit and vegetable processing industry. | CO3 | An | 10 |
|  | b. | Explain cryogenic pre-cooling technique for fruits and vegetables. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the principle behind hydro-cooling technique. | CO2 | U | 10 |
|  | b. | Discuss all the major constraints in expansion of fruit and vegetable processing industry. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the principle behind Vacuum cooling. | CO2 | U | 10 |
|  | b. | Explain in detail the factors influencing rate of evaporation. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Enlist all the steps used for processing of fruit juices and explain each step-in detail. | CO4 | U | 10 |
|  | b. | Describe the process and principle for Thermal concentration of fruit juices. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write in brief about aseptic process used in packaging of various fruit and vegetable product. | CO5 | R | 10 |
|  | b. | Discuss intelligent packaging systems and its applications. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the Interactive packaging. | CO5 | R | 10 |
|  | b. | Describe osmotic dehydration principle by a suitable example. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Give a note on Natural Circulation Evaporators. | CO2 | R | 10 |
|  | b. | Describe Freeze concentration for vegetable purees. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the Pineapple canning process in detail along with  processing flowchart. | CO6 | U | 10 |
|  | b. | Describe in detail Chemical, physical and microbial spoilage occurring in canned food products. | CO1 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Describe the Technological flow chart for the production of Marmalade. And note the defects and remedies while processing the marmalades. | CO6 | R | 20 |

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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 | 40 | - | - | - | - | 50 |
| CO3 | - | 10 | - | 10 | - | - | 20 |
| CO4 | - | 10 | - | - | - | - | 10 |
| CO5 | 20 | 10 | - | - | - | - | 30 |
| CO6 | 20 | 10 | - | - | - | - | 30 |
|  | | | | | | | **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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write the functions of nutrition and list the vitamins with their major application. | CO1 | U | 10 |
|  | b. | Explain skin fold Measurements methods. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Briefly discuss about digestion of food, assimilation and transportation of nutrient. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Briefly discuss about protein energy malnutrition. | CO1 | U | 10 |
|  | b. | Briefly explain about iron, vitamin B and iodine deficiency disorder. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Stepwise explanation of glycolysis cycle. | CO4 | An | 10 |
|  | b. | Explain reaction of TCA cycle in detail. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Briefly discuss about electron transport chain. | CO4 | U | 10 |
|  | b. | Briefly explain about Inter connection of pathways. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the degradation of fatty acids. | CO5 | U | 10 |
|  | b. | Explain about biosynthesis of fatty acids. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Briefly explain biosynthesis and degradation of glutamic acid and lysine. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Analyze biosynthesis and degradation of urea cycle. | CO6 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the classification and nutritional requirements for diabetes. | CO6 | U | 10 |
|  | b. | Briefly explain the nutrition requirement during pregnancy. | CO6 | U | 10 |

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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 |
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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** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Enumerate the composition of muscle and its modifiers. | CO1 | R | 10 |
|  | b. | Record the postmortem changes in muscle with a graphical representation. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the different types of stunning methods used in meat processing operations. | CO2 | U | 8 |
|  | b. | Differentiate flight zone and point of balance.Summarize the handling principles, facilities and restraint devices in detail. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 3. | a. | Define intermediate moisture foods. Illustrate the production process of intermediate moisture foods with a neat flow chart. | CO3 | A | 15 |
|  | b. | Distinguish cooked refrigerated and frozen meat products. | CO3 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Construct the steps involved in poultry processing with a special mention about the equipment used for processing. | CO4 | A | 10 |
|  | b. | Explain briefly the microbial quality characteristics of poultry meat and products. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Infer the factors affecting the quality of egg and their measurements. | CO5 | An | 10 |
|  | b. | Summarize the preparation of egg powder and its application | CO5 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Classify the types, role of casing and process involved in preparation of sausages. | CO3 | An | 15 |
|  | b. | Write short notes on meat plant sanitation and hygiene. | CO3 | C | 5 |
|  |  |  |  |  |  |
| 7. |  | Estimate the nutritive value and functional properties of egg. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define Fish Protein Concentrate. Prepare a flow chart for the production of FPC. | CO6 | C | 12 |
|  | b. | Criticize on Individual quick freezing of sea foods. | CO6 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Assess the factors responsible for spoilage of fish and fishery products. | CO6 | C | 10 |
|  | b. | Differentiate CSW and RSW? Record the changes observed during storage of fish in RSW and CSW. | CO6 | E | 10 |

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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 | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 |  |  |  |  |  | 20 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  |  | 15 | 20 |  | 5 | 40 |
| CO4 |  |  | 10 | 10 |  |  | 20 |
| CO5 |  |  |  | 10 | 30 |  | 40 |
| CO6 |  |  |  |  | 22 | 18 | 40 |
|  | | | | | | | **180** |