

End Semester Examinations - Nov-Dec 2015 Exams

14FP2001 Principles of Food Process Engineering

Set A

Time : 3 hrs
Total Marks: 100

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1. Derive the equation of state for ideal gas system with details on Charles and Boyles Laws. (20 Marks)
- OR**
2. A U-tube mercury manometer with one arm open to atmosphere is used to measure pressure in a steam pipe. The level of mercury in open arm is 97.5 mm greater than that in the arm connected to the pipe. Some of steam in the pipe condenses in the manometer arm connected to the pipe. The height of this column is 34 mm. The atmospheric pressure is 760 mm of Hg. Find the absolute pressure of steam with the help of a neat diagram of the process. (20 Marks)
3. Explain the kinetic theory and derive the kinetic equation for ideal gas system. (20 Marks)
- OR**
4. A steel flask of 0.04 L capacity is to be used to store nitrogen at 120 bar, 20°C. The flask is to be protected against excessive pressure by a fusible plug which will melt and allow the gas to escape if the temperature rises too high.
(i) How many kg of nitrogen will the flask hold at the designed conditions ? (10 Marks)
(ii) At what temperature must the fusible plug melt in order to limit the pressure of a full flask to a maximum of 150 bar? (10 Marks)
5. Consider a gas mixture that consists of 3 kg of O₂, 5 kg of N₂, and 12 kg of CH₄. Determine (a) the mass fraction of each component, (b) the mole fraction of each component, and (c) the average molar mass and gas constant of the mixture. (20 Marks)
- OR**
6. Explain Joule Thomson effect in detail with the aid of porous plug experiment. (20 Marks)
7. Discuss in short about (i) Psychrometric charts used in engineering calculation with a neat sketch (10 Marks)
(ii) Construction and working principle of sling psychrometer. (10 Marks)
- OR**
8. A rigid tank contains 2 kmol of N₂ and 6 kmol of CO₂ gases at 300 K and 15 MPa. Estimate the volume of the tank on the basis of (i) the ideal-gas equation of state, (ii) Kay's rule and (iii) compressibility factors and Amagat's law. (20 Marks)
9. (i) Explain the following process streams with applications and examples: (a) Recycle stream (b) Bypass stream (10 Marks)
(ii) Use mass balance principles and find out how much weight reduction would result when a material is dried from 80% moisture to 50% moisture? (10 Marks)
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End Semester Examinations - Nov-Dec 2015 Exams

14FP2002 Food Chemistry

Set B

Time : 3 hrs
Total Marks: 100

1. a. what is dispersed system? Discuss the types of instabilities associated with emulsion (8)
b. Describe the structure, function and properties of sucrose (7)
c. Differentiate between bound water and free water (5)

OR

2. a. Elaborate on the structure of water and ice and their implications in foods (10)
b. Discuss the nomenclature and outline the classification of carbohydrates (10)

3. a. Describe the chemistry and properties of microbial polysaccharide (8)
b. How is water sorption isotherm is related to the moisture content in a food? (5)
c. Explain the structure and properties of pectin and cellulose. (7)

OR

4. a. What is rancidity? Explain the types of rancidity with examples (7)
b. Discuss the physical and chemical properties of lipids with examples (8)
c. Illustrate the nomenclature of fatty acids with examples (5)

5. a. Discuss in detail about the processing refined and hydrogenated fats. (10)
b. Give a brief account on basic structures, chemistry & components of fatty acids. (10)

OR

6. a. Explain in detail about classification of amino acids with structure (12)
b. Elaborate on the applications of enzymes in food with examples (6)
c. Define enzyme immobilization and list out their methods (2)

7. a. Describe the nomenclature and classes of enzymes with suitable examples (8)
b. Discuss the flavor binding and gelation functional properties of protein (6)
c. What is protein denaturation? and explain its characteristics with example (6)

OR

8. a. Discuss about stability and the factors influencing bioavailability of folate (6)
b. Explain the stability and degradation of thiamine (6)
c. Describe the biological functions of vitamins (4)
d. List out the sources of fat soluble vitamins (4)

9. a. Illustrate on the organizational models of protein with their structure (12)
b. Describe the sources and biological functions of macronutrients (8)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2005 Heat and Mass Transfer

Set B

Time : 3 hrs
Total Marks: 100

1. Explain the process of heat transfer through a) Conduction b) Convection c) Radiation (15 marks)
Write a note on Thermal resistance (5 marks)

OR
2. a). Derive an expression for heat transfer in conduction through tubular pipe (10 marks)

b). 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 (7 marks)

c). Write a note on unsteady state heat conduction (3 marks)
3. a). Write in detail about dimensionless numbers used in convection heat transfer (10 marks)

b). Explain the various stages of Boiling. (10 marks)

OR
4. A stainless-steel pipe (thermal conductivity 17 W/[m °C]) is being used to convey heated oil . The inside surface temperature is 130°C. The pipe is 2 cm thick with an inside diameter of 8 cm. The pipe is insulated with 0.04 m thick insulation(thermal conductivity 0.035 W/[m °C]). The outer insulation temperature is 25°C. Calculate the temperature of the interface between steel and insulation, assume steady-state conditions. (12 marks)

Explain the mechanism of condensation (8 marks)
5. Explain in detail about various surfaces involved/considered in radiation (10)
State Stephen-Boltzman's law (4)
Write a note on grey body emissivity (6)

OR
6. Describe in detail about any three laws governing radiation.
7. Explain the basics of Radiation Heat transfer (10)
State i) Planck's law ii) Wien's displacement law (10)

OR
8. Explain the principle and working 1-2 Shell and tube heat exchanger with a sketch (10)
Write a note on Tubular heat exchanger (5)
Define LMTD (5)
9. Explain the following
 - a. Steady state diffusion
 - b. role of turbulence in diffusion
 - c. Fick's law of diffusion
 - d. Mole

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2006 Dairy Engineering and Technology

Set A

Time : 3 hrs
Total Marks: 100

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1. Explain the structure, interactions and various chemical aspects of the structural stability of casein protein with a neat diagram. (20 Marks)

OR

2. Explain milk fat crystallization and changes occurring in milk constituents due to milk processing. (20 Marks)

3. Explain the process of testing milk by

(i) Alcohol-Alizarin Test (7 Marks)

(ii) Resazurin Test (7 Marks)

(iii) Gerber's Test (6 Marks)

OR

4. Write notes on application of enzymes in dairy industry. Explain the industrial application and biochemistry of each enzyme. (20 Marks)

5. Explain the construction and working of:

(i) Plate heat exchanger (10 Marks)

(ii) Scraped Surface heat exchanger (10 Marks)

OR

6. Write short notes on the various steps involved in milk collection and transport. (20 Marks)

7. Write in detail about the construction and principle of:

(i) Plate and frame filter module (10 Marks)

(ii) Tubular membrane filtration modules (10 Marks)

OR

8. Write in detail about the design, working and applications of:

(i) Liquid ring pump (10 Marks)

(ii) Lobe rotar pump (10 Marks)

9. Write in detail with a flow chart about manufacturing of different types of cheese. (20 Marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2007 Unit Operations in Food Process Engineering - I

Set A

Time : 3 hrs
Total Marks: 100

1. Explain the working of planetary mixer and double cone mixer with neat sketch. List the applications of mixing of solids in food processing.(20 marks)

OR

2. A fortified high protein dough is being made by adding 20 per cent soya flour to the maida flour. The two dry flours are mixed in a ribbon mixer to make the dough. After 10 minutes, six samples were collected and analysed for soya flour, the following are the fractional compositions : 0.2195, 0.22, 0.19, 0.185, 0.205, 0.191. Calculate the mixing index and standard deviation. Find how much time, it needs to be mixed for getting a variance of 1×10^{-4} . (20 marks)
3. Explain the following with neat sketch a) Scrapped surface evaporator and b) Long tube rising film evaporator. (20 marks)

OR

4. A triple effect evaporator is used to concentrate a fruit juice at the rate of 1000 kg/h flow rate with 5 per cent solids to 30 per cent solids. The temperature of the steam in the first effect evaporator is 120 °C and the boiling point in the last effect is 55 °C. The heat transfer coefficient of each evaporator is 2, 1.8 and 1.5 kW/m² °C. Assuming that there is no boiling point elevation and the specific heat of food is 4.5 kJ/kg °C in the entire range of temperature, find the steam consumption, ΔT in each evaporator and the heat transfer area of any one evaporator since all evaporators are identical. (20 marks)
5. A. Describe any one method of determination of equilibrium moisture content.(10 Marks)
- B. Determine the value of c and n from Henderson's equation for the following data: (10 Marks)

RH (%)	Temperature, t (°C)	M _e (%)
40	60	8.65
80	60	14.62

OR

6. Describe the working of the following with neat sketch. a) Spray dryer and b) Deep bed and flat bed dryers. (20 marks)
7. Derive the expressions for constant rate and constant volume filtration. (20 marks)
- OR**
8. Explain the working of the following with a neat sketch: a) Plate and Frame filter press and b) Basket centrifuge. (20 marks)
9. A) Explain the theory of size reduction.(10 Marks)
- B) Explain the working of Plate mill with a neat sketch.(10 Marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2008 Fruit and Vegetable Processing Technology

Set A

Time : 3 hrs
Total Marks: 100

1. What is Nutrition? Enumerate the macro and micronutrients in fruits and vegetables and mention it's functions[20Marks]

OR

2. Explain the post harvest field operations with a special mention about the packaging of fruits and Vegetables. [20Marks]

3. Discuss the cooling methods and storage types of fruits and vegetables in detail. [20Marks]

OR

4. Describe about the canning operations and changes during storage in detail. [20Marks]

5. a)Explain in detail about the role of ingredients, steps involved in jam making process.[12 Marks]

b)Give a detailed note on the production of pickled product[8 Marks]

OR

6. Elucidate the steps involved in preparation of fruit puree in detail [20 Marks]

7. Draw a flow chart and describe the steps involved in production of filtered and cloudy fruit drinks in detail [20 Marks]

OR

8. Write short notes on a) Fruit Juice powder [10 Marks]

b) Dehydrated fruit slices [10 Marks]

9. Explain the working principle of spray dryer with a diagrammatic representation.[20 Marks]
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End Semester Examinations - Nov-Dec 2015 Exams

14FP2010 Unit Operations in Food Process Engineering - II

Set A

Time : 3 hrs
Total Marks: 100

1. A. Write a detailed description on flash distillation process with diagram.(10 marks)

B. Explain the principle and theory of diffusion process.(10 marks)

OR

2. A. Explain the batch distillation process with a neat sketch.(10 marks)

B. Calculate the relative volatility for benzene-toluene system at 90°C and 107°C for the given data: At 90°C, $P_A = 117$ kPa and $P_B = 48.0$ kPa and at 107°C $P_A = 207$ kPa and $P_B = 89.0$ kPa (5 marks)

C. Calculate the vapour and liquid compositions in equilibrium at 97°C for benzene-toluene at 103.32 kPa using the following data: For benzene $P_A = 158.7$ kPa and $P_B = 65.5$ kPa (5 marks)

3. A. Explain the super critical fluid extraction process with a neat diagram.(10 marks)

B. The natural food colour from beet root is to be extracted with water. The saturated concentration of the colour in the water is found to be 1.5 kg/m³. In a laboratory scale extractor containing about one litre volume, it has taken 10 minutes to extract the colour from beet root to an extent of 985 ppm. Under similar conditions in a commercial plant of 10 m³ capacity, it is desired to extract 12 kg of the colour into the water. How much time does it take? (10 marks)

OR

4. A. Explain the single stage batch extraction process with a neat sketch.(10 marks)

B. Discuss the principles of extraction and enumerate the applications of extraction in food processing.(10 marks)

5. A. Explain the working principle and functioning of draft tube baffle crystallizer with a sketch.(10 marks)

B. Describe a batch crystallizer with a neat diagram explaining its application in food processing.(10 marks)

OR

6. A. Discuss the importance of mixing and agitation in crystallization process.(10 marks)

B. Enlist the various applications of crystallization in food processing.(10 marks)

7. A. Explain concentration polarization and gel polarization.(10 marks)

B. A membrane for microfiltration was examined microscopically and found to have about 1,20,000 pores with an average diameter of 0.75×10^{-6} m per mm² of membrane surface. The thickness of the membrane is 180×10^{-6} m. The viscosity of the permeate is 0.0016 Pa.s. Estimate the following : a) Porosity of the membrane (ϵ), b) Hydraulic Permeability (L_p) and c) Permeate Flux(J) for a Trans membrane Pressure Difference(ΔP_{TM}) of 1.25 Pa.(10 marks)

OR

8. A. Explain the solvent transport process in reverse osmosis and application of the process.(15 marks)

B. Estimate the osmotic pressure of orange juice with 11% total solids at 20°C. The density of orange juice is 1063 kg/m³, Gas constant = 8.314 (m³ kPa/kg mol K) and molecular weight is 180 kg/kg mol.(5 marks)

9. **Compulsory**

Discuss in detail about ion exchange materials and describe the equilibrium relations of ion exchange.(20 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2011 Refrigeration, Air conditioning and Cold Storage

Set A

Time : 3 hrs
Total Marks: 100

1. 1. Explain with a neat diagram of freezer for i) Solid foods and ii) Liquid foods (8)
 2. Write a note on spoilage of foods by microbial organisms. (6)
 3. Explain in brief about different zones of freezing curve of foods. (6)

OR

2. 1. A food product is being frozen in an air-blast freezer. The initial product temperature is 14°C and the cold air - 30°C. The product geometry is sphere with a 7 cm diameter & density of 1000 kg/m³, the initial freezing temperature is - 2.25°C, the thermal conductivity of the frozen product is 1.2 W/(m K), and the latent heat of fusion is 200 kJ/kg. Compute the freezing time using Plank's method. (8)
2. Write a note on High care area role in food production (6)
3. Write any 4 points about Good Manufacturing Practice (6)
3. Explain in detail about different types of packagings available for food materials. (15)
- Write a note on hydrocooling. (5)

OR

4. 1. Explain with a neat diagram the working of Air-blast chiller (8)
2. Write in brief about the application of Individual Quick Freezing (7)
3. What do you mean by Cryogenic freezing? (5)
5. 1. Write down the importance of cooling load calculation in cold storage construction. (7)
2. Write a note on i) Polyurethane foam ii) Corks (8)
3. What changes in quality will occurs during storage of frozen foods? (5)

OR

6. 1. Describe with a neat diagram working of i) Grilles ii) Registers (10)
2. Write a brief note on pre-freezing (5)
3. How can we improve the quality of frozen food? (5)

7. Describe the importance cold supply chain management and its growth in India.

OR

8. Give the advantages of using Barcodes and RFIDs in cold chain.

9. Illustrate with neat sketch working of vapor absorption Refrigeration system (10)
- State Gibbs-Dalton law (4)
- The air with 30 °C dry bulb temperature and 28.5 g water/kg dry air is heated to 70 °C.
- Find the relative moisture content, wet bulb temperature, dew-point temperature, humid volume and enthalpy of the air. (6)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2013 Storage Engineering

Set A

Time : 3 hrs
Total Marks: 100

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|----|---------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1. | i. Explain the working and construction of a LSU Dryer. | 15 marks |
| | ii Why does WFP have a policy against the use of methyl bromide? | 5 marks |
| | OR | |
| 2. | i. Explain the working and construction of a Baffle Dryer. | 15 marks |
| | ii Define the term Mamillary Toxicity. | 5 marks |
| 3. | i. Explain the working and construction of a Flat Bed Dryer. | 15 marks |
| | ii What are the properties of phosphine gas? | 5 marks |
| | OR | |
| 4. | Describe the fumigation of grains in bag stack. | 20 marks |
| 5. | i. How is phosphine gas measured? What is the safety precautions used while measuring phosphine gas? | 5 marks |
| | ii Write a traditional structures used for temporary & long term storage of grains. | 15 marks |
| | OR | |
| 6. | i. Write a descriptive note on the primary pests in pulses. | 15 marks |
| | ii. What's the difference between a primary & a secondary pest? | 5 marks |
| 7. | i. What are the two distinct methods of dry grain in an unheated type of dryer? | 5 marks |
| | ii. Write a descriptive note on the secondary pests in grain storage. | 15 marks |
| | OR | |
| 8. | i. Describe the Incomplete & Complete Metamorphosis in Insect Pests with suitable diagrams? | 10 marks |
| | ii. Write a note on the different aeration systems and air distribution systems used in a dryer. | 10 marks |
| 9. | Describe the improved storage structures that are predominantly used in tropical & subtropical countries for storage of grains. | 20 marks |
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End Semester Examinations - Nov-Dec 2015 Exams

14FP2017 Supply Chain Management

Set B

Time : 3 hrs
Total Marks: 100

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1. Write in detail about cycle view of supply chain process with suitable examples (20 marks)
OR
 2. With a suitable example explain the functional units and importance in SCM (20 marks)
 3. Explain in detail the different methods of Six Sigma analysis with examples (10 marks)
Write in detail the steps involved in purchasing process of sourcing (10 marks)
OR
 4. With a suitable example about bow tie model in supplier relation management (10 marks)
Write in detail about agile supply chain management and its importance (10 marks)
 5. Explain in detail the influence of Information Technology in supply chain management and the impact of technology in industrial growth (20 marks)
OR
 6. What is sustainability in SCM and state the strategies for achievement of sustainability in SCM with examples. (20 marks)
 7. What is logistics in SCM and write in detail third party logistics in present day industrial SCM with emphasis on Food industry. (20 marks)
OR
 8. What is outsourcing and state the steps involved and strategies adapted in outsourcing and its impact on SCM (20 marks)
 9. Compulsory:
Explain the concept of lean supply chain production and various steps involved in it with suitable examples. (20 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP2024 Mechanical Systems for Food Processing

Set B

Time : 3 hrs
Total Marks: 100

1. Write in detail about the working of the following with a sketch:

(i) Vane pump (10 Marks)

(ii) Peristaltic pump (10 Marks)

OR

2. The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. (20 Marks)

3. Write in detail about the following with a neat diagram

(i) Cross Belt drive (6 Marks)

(ii) Stepped pulley belt drive (7 Marks)

(iii) Fast and loose pulley drive (7 Marks)

OR

4. Two pulleys one 450mm diameter and the other 200mm diameter are on parallel shafts 1.95m apart and are connected by cross belt. Find the length of belt and angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25. (20 Marks)

5. Write in detail about the following with a neat diagram

(i) Bushed pin flange coupling (10 Marks)

(ii) Oldham coupling (10 Marks)

OR

6. Write in detail about the construction, working, advantages and limitations of Babcock and Wilcox boiler with a neat diagram. (20 Marks)

7. (i) Differentiate water tube and fire tube boilers. (8 Marks)

(ii) Write notes on boiler accessories and explain any two with a neat diagram. (12 Marks)

OR

8. Write in detail about types of equipment used, operation and application in food industries of the following:

(i) Liquid Freezing (10 Marks)

(ii) Air Freezing Equipment (10 Marks)

9. Discuss in detail about the applications of various type of material handling equipment in various aspects of food industries. (20 Marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP3001 Separation Processes in Food Engineering

Set B

Time : 3 hrs
Total Marks: 100

1. A. Derive the expression to compute the differential pressure between two tanks connected with a U-tube differential manometer. The tanks are located at same level flowing with liquids of different densities. Consider the manometric fluid as mercury. (10 marks)

B. Fruit juice concentrate is flowing at $0.26 \text{ m}^3/\text{min}$ in a pipe of diameter 35 mm. The specific gravity of the juice is 1.06 and the viscosity is 0.0026 Pa. s. Determine the type of flow of the concentrate in the pipe. (10 marks)

OR

2. A. A 40 cm diameter pipe conveying liquid food converges in to 30 cm diameter at the other end and then branches into two pipes of diameters 17.5 cm and 15 cm respectively. If the average velocity in the 40 cm pipe is 3 m/s, compute the following : a) the discharge in the pipe, b) the velocity at the converging end and c) the velocity in the 17.5 cm pipe if the average velocity in the 15 cm pipe is 2.5 m/s. (10 marks)

B. An evaporator is used to concentrate cane sugar solution. A feed of 10,000 kg/day of a solution containing 38% sugar is evaporated producing 74% of sugar solution. Calculate the weight of solution produced and amount of water removed. (10 marks)

3. A. Fruit juice is filtered using a filter press having a cross sectional area of 2 m^2 under a gauge pressure of $2 \times 10^5 \text{ Pa}$. The feed has a solid content of 20 g per litre whose density is 900 kg/m^3 . The viscosity of the filtrate is 0.001 Pa. s. The volume of the filtrate collected with time are as given below:

T, min	7	25	54	90
V, litre	5	10	15	20

Determine the specific cake resistance(α) and equivalent cake thickness(L_m). (20 marks)

OR

4. A. Explain the working of rotary vacuum filter press with a neat sketch. (10 marks)
- B. Discuss about material balance in screens and derive the formula for screen effectiveness. (10 marks)

5. A. Describe in detail about the principle and working of basket type centrifuge. (10 marks)
- B. In the refining process of edible oil, an aqueous phase is being separated from the oil phase by using a centrifuge. The density of the aqueous phase is 968.5 Kg/m^3 and that of oil is 860.2 Kg/m^3 . The radius for the overflow of heavy liquid has been set at 11.82 mm and the outlet for the light liquid at 11.26 mm. Calculate the location of the neutral zone of interface of the two phases. (10 marks)

OR

6. A. Derive the expression to find the settling velocity of particles in a centrifuge (10 marks)
- B. A basket centrifuge with solid walls of 0.6 m height contains 70 kg of water. The centrifuge rotates at 2000 rpm. Consider the density of water as 1000 Kg/m^3 . Calculate the following : a) Angular Velocity, b) Inner radius of the annular water mass ($r_2^2 - r_1^2$) and c) The pressure (P) developed at the walls of the centrifuge. (10 marks)

7. A. Explain the solvent transport process in reverse osmosis and application of the process. (10 marks)

B. A membrane for microfiltration was examined microscopically and found to have about 2,50,000 pores with an average diameter of $0.75 \times 10^{-6} \text{ m}$ per 2 mm^2 of membrane surface. The thickness of the membrane is $180 \times 10^{-6} \text{ m}$. The viscosity of the permeate is 0.0016 Pa.s. Estimate the following : a) Porosity of the

membrane (€), b) Hydraulic Permeability (L_p) and c) Permeate Flux(J) for a Trans membrane Pressure Difference(ΔP_{TM}) of 1.25 Pa. (10 marks)

OR

8. A. Explain concentration polarization and gel polarization. (10 marks)

B. The concentration of whey is being accomplished by using an ultrafiltration membrane to separate water. The 10 kg/min of feed stream has 6 % solids and is being increased to 20 % total solids. The membrane tube has a 5 cm inside diameter and the pressure difference is 2000 kPa. Estimate the flux of water through the membrane and length of the membrane tube when the hydraulic permeability is 4×10^{-5} kg of water/m²kPa.s (10 marks)

9. **Compulsory**

A. Describe the process of diffusion in porous foods. (10 marks)

B. Explain the process of Interphase moisture transport in foods. (10 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP3003 Technology of Food Flavourants and Colourants

Set A

Time : 3 hrs
Total Marks: 100

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1. a. What are the basic tastes? Discuss in detail on the structure, activity, relationship between chemicals and their taste perception. (12)
b. What is flavour enhancer and flavour modifier? Discuss with examples. (8)

OR
 2. a. Discuss the basics of colour and their physical phenomena and measurement. (10)
b. Describe the biogenesis of fruit flavour through protein metabolism (10)
 3. a. What are essential oils? Discuss in detail on the methods of production of essential oils. (8)
b. Elaborate on the development of flavours during food processing (7)
c. Describe the biogenesis of fruit aroma by fat metabolism (5)

OR
 4. a. Describe the sources, chemistry and occurrence of anthocyanin in food systems (12)
b. Explain the chemistry and extraction of cochineal pigments (8)
 5. a. Elaborate on the chemistry and stability of carotenoids in foods (5)
b. How the monascus pigments are produced through fermentation route and what is its advantage of solid state fermentation over submerged culture. (7)
c. Write briefly on the methods for production of dried colours (8)

OR
 6. a. Describe the methods for the production of annatto extracts with its application as colorant. (10)
b. What is caramel and describe its manufacture on large scale. What are its applications? (10)
 7. a. Explain how cocoa and coffee develop their aroma during thermal processing. (10)
b. What are the main advantages of super critical fluid extraction? What are the solvents that are used and what are the effects of the solvents? (10)

OR
 8. a. Discuss in detail on the stability of chlorophyll pigments and the effect of various methods of Food processing on their stability. (10)
b. Write briefly on the functions and applications of classical two dimensional gas chromatography (10)
 9. a. Explain the principles of e-nose technology. (10)
b. Describe Beer Lambert's Law and its utilization in the instrumental methods of analysis. (10)
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End Semester Examinations - Nov-Dec 2015 Exams

14FP3005 Instrumental Techniques for Food Quality and Safety

Set A

Time : 3 hrs
Total Marks: 100

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1. Classify chromatographic methods based on stationary and mobile phase (8 marks)
How column chromatography is performed to separate the components of a mixture (12 marks)
OR
2. What are the advantages of HPLC over GC and how the quantification of the component is done using HPLC (12 marks)
How qualitative and quantitative analysis can be carried out by using chromatography (8 marks)
3. With neat sketch explain the methods of separation of mixtures using GC (10 marks).
What is the role of detectors in gas chromatography, how components are detected by using Flame Ionization Detector and Thermal Conductivity Detector (10 marks).
OR
4. To detect metallic elements at trace level which spectrometry would you prefer and explain its working principle with neat sketch (15 marks)
What is atomization of a sample and what are the methods adopted (5 marks)
5. Write a brief note on energy component of atoms and molecules (5 marks)
Describe with a neat sketch the construction and working of ICP- OES (15 marks)
OR
6. What are hyphenated techniques and discuss about the application of GC-MS, LC-MS and FAB-MS in food analysis (20 marks)
7. Write short note on the following terms in Mass Spectrometry
i. Sample inlet (7 marks)
ii. Ionization source and acceleration chamber (6 marks)
iii. Mass analyzer (7 marks)
OR
8. What is the role of FT – IR in predicting the structure of the compound and explain the working principle of FT – IR (20 marks)
9. Why structure prediction of a compound is important and what type of information is needed to predict the structure of a compound (10 marks)
Explain the principle of NMR with the significance of various spin quantum number (10 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP3006 Storage Engineering of Grains

Set B

Time : 3 hrs
Total Marks: 100

1. a. Write a brief note the different Primary Insect Pests that are of importance in pulses. **(10 marks)**
b. Briefly the different spices of secondary pest that is prevalent in crops of commercial importance. **(10 marks)**

OR

2. a. How do we check if a particular species of insect pest is developing resistance to fumigation? **(5 marks)**
b. Write a note on the traditional temporary and long term storage structures. **(15 marks)**
3. a. How is phosphine gas measured in fumigated warehouses? How long should crops be exposed to phosphine gas? **(15 marks)**
b. Define the term “Mammalian Toxicity” & “Fumigation”. **(5 marks)**

OR

4. a. Describe the functioning, material of construction, air flow/grain flow, advantages & disadvantages of the Rotary dryer **(10 marks)**
b. Describe the functioning, material of construction, air flow/grain flow, advantages & disadvantages of the Baffle dryer **(10 marks)**
5. a. Describe the functioning, material of construction, air flow/grain flow, advantages & disadvantages of the LSU dryer **(10 marks)**
b. Describe the functioning, material of construction, air flow/grain flow, advantages & disadvantages of the Flat bed dryer **(10 marks)**

OR

6. a. Describe the functioning, material of construction, air flow/grain flow, advantages & disadvantages of the Columunar dryer **(10 marks)**
b. Describe how bag stacks are fumigated with phosphine gas (use diagrams for all necessary steps) **(10 marks)**

7. Write a note on the polymer, gases and converting technology used in MAP? **(20 marks)**

OR

8. a. What are the biological, chemical and physiological changes that take place in grains on storage? **(15 marks)**
b. What is OTR? How is it calculated for a film that is made out of three different polymers by coextrusion or lamination? **(5 marks)**
9. Write a note on improved storage structures used for storage of grains. **(20 marks)**

Wishing you All the Best

Reg. No. _____

Karunya University

(Karunya Institute of Technology and Sciences)

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – November / December - 2015

Subject Title: INDUSTRY WASTE MANAGEMENT

Time : 3 hours

Subject Code: 14FP3017

Maximum Marks: 100

Answer ALL questions (5 x 20 = 100 Marks)

1. a. As a Biotechnologist / Food technologist you are expected to dispose food waste in an ecofriendly manner. Justify the method(s) you would adopt . (5)
b. Comment on the Legislations pertaining to Food waste disposal. (15)

(OR)

2. a. Explain the good housekeeping procedure to minimize the raw material waste. (15)
b. Analyze the biological basis of bio-wastes (5)
3. a. Explain in detail issues related to waste management system in any one food industry? (15)
b. Write short note on the important sources of high value co-products in fruit and vegetable processing? (5)

(OR)

4. a. Explain the importance and strategies of microbiological risk assessment in stabilization of food processing ? (10)
b. Explain in detail the component stages of QMRA for the control of microbiological hazards each stage throughout the process ? (10)
5. a. Comment on methods to minimize water usage in food industries and present state-of-the-art and future trends in wastewater treatment – (15)
b. Explain a case study relating to waste water treatment in food industry (5)

(OR)

6. a. Describe various methods for solid waste treatment in food industries (10)
b. Describe various methods for liquid waste treatment in food industries (10)
7. a. Comment on the role of value added products in food industries? (10)
b. Narrate methods of waste disposal in meat processing industry (10)

(OR)

8. a. Elaborate the bio-catalytic and enzymatic methods of approach of handling waste and coproduct recovery ? (10)
b. Explain the important sources of high value co-products in fruit and vegetable processing ? (10)

Compulsory :

9. a. Critically analyze the strategies to be followed for optimizing manufacturing to minimize food wastes (15)
b. Discuss with case studies methods of managing food wastes (5)

End Semester Examinations - Nov-Dec 2015 Exams

14FP3018 Refrigeration and Cold storage Engineering

Set B

Time : 3 hrs
Total Marks: 100

-
1. Write down the important properties of frozen foods. (10)
Give the importance of freezing time estimation of foods with a freezing curve. (10)

OR
 2. 1. 500 kg of fish at 30°C are kept in a bunker with 100 kg of blocks of ice at 0 °C. It has taken 8 hours for the ice to melt to water at 0°C. Maintaining the same heat transfer rate, find what will be the equilibrium temperature of fish and water, and after how many hours this would occur? The specific heat of fish may be taken as 5.2 kJ/kg °C. (10 marks)

2. A spherical food product is being frozen in an air-blast freezer. The initial product temperature is 10°C and the cold air - 40°C. The product has a 7 cm diameter with density of 1000 kg/m³, the initial freezing temperature is - 1.25°C, the thermal conductivity of the frozen product is 1.2 W/(m K), and the latent heat of fusion is 250 kJ/kg. Compute the freezing time. (10 marks)
 3. 1. Explain in detail about trucks used for cold foods transportation and their temperature control principles. (10)
2. Describe the importance of Doors used in cold storage management. (10)

OR
 4. 1. Write a note on i) Vacuum skin packaging ii) Active packaging (10)
2. Write down the merits of paper as packaging material. (10)
 5. 1. Describe the importance of optimum temperatures of storage for different food materials (10)
2. Write a note on stackings available for food materials. (10)

OR
 6. 1. With neat diagrams explain the working of 2 air diffusion equipments. (10)
2. Give the classification of insulators. (5)
3. Write a note on walk-in coolers. (5)
 7. 1. Explain the different methods of field chilling. (10)
2. Give the protocols for sea and air freights. (10)

OR
 8. 1. Write down the details of RFID used in cold chain (10)
2. Write short notes application of Barcodes in tracing tracking. (10)
 9. Describe with neat sketches the components of a Refrigeration system
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End Semester Examinations - Nov-Dec 2015 Exams

14FP3021 Design of Food Processing Equipments

Set A

Time : 3 hrs
Total Marks: 100

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1. Name some of the mechanical properties of the material which is crucial in deciding the material of construction for vessel design (15 marks)
- Draw the symbol for kettle type reboiler and centrifuge (5 marks)
- OR**
2. What is the need for linings in process equipment design explain the application with examples (14 marks)
- List some of the basic considerations in process equipment design and what is its significance (6 marks)
3. What are the ferrous and non ferrous metals used for materials of construction explain in detail (12 marks)
- Using Fourier's law of heat conduction derive the expression of temperature profile for the steady state heat transfer through single wall (8 marks)
- OR**
4. What are the high pressure vessel fabrication techniques (12 marks)
- Write short note on the following jackets for reaction vessels (8 marks)
- Plain jacket
- Half pipe coil jacket
5. What is the advantage of multiple effect evaporator obtain the material and energy balance equation for double effect evaporator (10 marks)
- A single effect evaporator operates at 0.15 atm absolute pressure. What will be the heating surface necessary to concentrate 1.25 kg/sec of 10% caustic soda solution to 40% assuming a value of overall heat transfer coefficient as 1500 Kcal/hr m²°C and using steam at 120°C (latent heat 540 Kcal/kg). The heating surface is 1.2m below the liquid level. The following data may be used if required. B.P.R. of solution = 30°C: Feed temperature = 18°C; specific heat of the feed 0.95 Kcal/Kg°C; specific heat of the product = 0.8 Kcal/Kg°C and specific gravity of the boiling liquid is 1.39 (10 marks)
- OR**
6. Illustrate with a neat sketch the construction and working of cabinet dryers (10 marks)
- Explain the working of Rotary dryer with neat sketch (10 marks)
7. A fluidized bed dryer is being used to dry diced carrots. The product enters the dryer with 60% moisture content (wet basis) at 25°C. The air used for drying enters the dryer at 120°C after being heated from ambient with 60% RH at 20°C. Estimate the production rate when air is entering the dryer at 700 kg dry air/h and product leaving the dryer is at 10% moisture content (wet basis). Assume product leaves the dryer at the wet bulb temperature of air and the specific heat of product solid is 2.0 KJ/kg°C. Air leaves the dryer 10°C above the product temperature (15 marks).
- What are the factors that affects the solar tunnel dryers and state its applications (5 marks).
- OR**
8. Starting from the material balance obtain the design equation for the following

Batch reactor (10 marks)

Plug Flow Reactor (10 marks)

9. Derive the expression for steady state heat transfer through hollow cylinder (10 marks)

An oil pipe line $d_i/d_o = 44/51$ mm in the diameter is covered with a layer of concrete, 80mm thick. The thermal conductivity of pipe line material is $43 \text{ kcal/hr m}^\circ\text{C}$ and that of concrete is $1.1 \text{ kcal/hr m}^\circ\text{C}$. The mean temperature of the oil is 120°C and the ambient air temperature 25°C . The total coefficient of heat transfer from oil to the wall is $86 \text{ kcal/hr m}^2\text{C}$ and that from the concrete surface to the air is $8.6 \text{ kcal/hr m}^2\text{C}$. Calculate the loss of heat from length of 1 meter of a bare pipeline and from the same length of the pipeline covered with concrete (10 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14FP3023 Food Material Science

Set B

Time : 3 hrs
Total Marks: 100

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1. a. What is a state diagram? How will you develop a state diagram? (10 marks)
b. Discuss in detail on Glass Transition temperature and its significance in food product quality (10 marks)
OR
 2. a. Discuss in detail on the polymer crystallisation kinetics (12 marks)
b. Write briefly on the steps involved in crystallisation of a compound (8 marks)
 3. Discuss in detail on the recent trends in the manufacture of texturised proteins
OR
 4. Write in detail on a. Protein / Protein interactions in development of a composite structure in foods (10 marks)
b. Mixed dairy gels (10 marks)
 5. a. Discuss in brief on the factors affecting stability of emulsions. (8 marks)
b. Discuss in detail on Pickering emulsions (12 marks)
OR
 6. Discuss in detail on the principles and applications of Diffusing - wave spectroscopy.
 7. Derive the rate equation for the reaction between a sugar and an amino acid, when the sugar concentration is 1000 times the concentration of amino acid.
OR
 8. Briefly discuss on the following (2 x 10 = 20 marks) a. Type of amino acids and sugars on the rate of Maillard browning.
b. Fluorescent products as indicators of Maillard browning.
 9. Write short notes on the following- a. Flory Stockmayer theory (5marks) b. Diffusion limited aggregation model Theory (5 marks) c. Behaviour of Starch and Casein Gels (10 marks)

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