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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define aspect ratio of a material. | | CO1 | R | 1 |
| 2. | List any four techniques used for measuring porosity in food materials. | | CO1 | R | 1 |
| 3. | Recall the recoil phenomenon of a viscoelastic food material. | | CO2 | R | 1 |
| 4. | Differentiate between plastic fluid and viscous fluid. | | CO2 | U | 1 |
| 5. | Infer the expression for enthalpy of a moist material. | | CO3 | U | 1 |
| 6. | Name a method used to determine gelatinization enthalpy of starch samples. | | CO3 | R | 1 |
| 7. | State the significance of surface-active materials with an example. | | CO4 | R | 1 |
| 8. | Outline the forces acting on a body immersed in a fluid current. | | CO4 | U | 1 |
| 9. | Name the instrument used to determine the texture of peas. | | CO5 | U | 1 |
| 10. | Interpret the significance of an object's optical density. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Define sphericity and deduce an expression for the triaxial ellipsoid. | | CO1 | An | 3 |
| 12. | Interpret the apparent viscosities of the time-independent fluids. | | CO2 | U | 3 |
| 13. | Define specific heat and relate its expression for grains with more than 8% moisture content. | | CO3 | U | 3 |
| 14. | Derive an expression for the drag and lift coefficient using dimensional analysis. | | CO4 | An | 3 |
| 15. | Interpret the effect of temperature on dielectric properties of food. | | CO5 | U | 3 |
| 16. | Describe the phenomenon of refraction and highlight the applications of the refractive index in food analysis. | | 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. | Compare the liquid displacement (pycnometer) and solid displacement methods for determining the volume of a food sample. | CO1 | E | 8 |
|  | b. | Apply the principle of an airflow planimeter with sketches and explain the procedure to determine the surface area of food material. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Derive an expression for Newton’s law of viscosity for fluid flow between two parallel plates. | CO2 | An | 8 |
|  | b. | Explain the construction principle of a capillary flow viscometer, with sketches, to determine the viscosity of a Newtonian fluid. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 19. |  | Compare a steady-state and an unsteady-state method for measuring the thermal conductivity of food materials. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 20. | a. | Derive an expression for the terminal velocity of a spherical particle in a fluid medium using Stokes' law. | CO4 | An | 8 |
|  | b. | Calculate the height of rise of water in a clean capillary tube of radius 0.001 cm if the density of water is 997 kg/m3, surface tension is 73 dynes/cm, and the contact angle of water to the glass is 10◦. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 21. |  | Describe the various characteristics of a Texture Profile Analysis (TPA) curve, including its key properties, with illustrative sketches. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Cherries have a moisture content of 77.5% (wet basis) and an apparent density of 615 kg/m³, with a bulk density of 511 kg/m³ at 25°C. Assuming cherries consist only of water and carbohydrates, and given that the densities of carbohydrate and water are 1586 kg/m³ and 997 kg/m³, respectively. Determine the total porosity when cherries are stacked in bulk. | CO1 | A | 6 |
|  | b. | Compare the compression and puncture tests in evaluating the firmness of a product, highlighting their differences and applications. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 23. |  | Describe the dielectric properties of food materials and the methods used for their measurement, supplemented with illustrative sketches. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the working principle of a spectrophotometer and the process of color measurement using the CIE color order system. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Identify the different physical properties of biological materials. |
| **CO2** | Interpret the rheological properties of food and measurement methods. |
| **CO3** | Examine the various thermal properties of food and its measurement techniques. |
| **CO4** | Analyze the hydro and aerodynamic properties of biological materials. |
| **CO5** | Choose appropriate textural and electromagnetic techniques for characterization of food materials. |
| **CO6** | Justify use of appropriate color measuring devices for sorting of food materials using optical properties |



**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define packaging. | | CO1 | U | 1 |
| 2. | Define reaction quotient. | | CO2 | R | 1 |
| 3. | State the glass transition temperature. | | CO3 | R | 1 |
| 4. | Name the colorant used for making amber glass. | | CO3 | R | 1 |
| 5. | Infer the weight (g/m2) range of glassine paper. | | CO3 | R | 1 |
| 6. | Identify the use of kappa number. | | CO3 | A | 1 |
| 7. | Define lap seal. | | CO4 | R | 1 |
| 8. | Write any two methods used to print on food packages. | | CO5 | A | 1 |
| 9. | Recall the significance of GTR. | | CO5 | R | 1 |
| 10. | Expand TTIs. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain any two changes that occur in the food due to fat oxidation. | | CO2 | An | 3 |
| 12. | List any three advantages of metal cans. | | CO1 | A | 3 |
| 13. | List any three characteristics of soft wood and hard wood fibres. | | CO3 | R | 3 |
| 14. | Distinguish between thermosetting and thermoplastics. | | CO3 | U | 3 |
| 15. | Explain the working principle of vacuum sealing. | | CO4 | A | 3 |
| 16. | Interpret the classification of biobased and biodegradable packaging materials. | | 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. | Summarize the intrinsic and extrinsic factors that affect the quality of the food. | CO1 | U | 6 |
|  | b. | Explain all the basic functions and requirements of the packaging. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate the manufacturing process of three-piece cans. | CO3 | A | 6 |
|  | b. | Analyze the essential requirements for an interior coating of metal cans. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Examine how each section of the paper-making machine influences on the paper's final characteristics. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. | a. | Describe the applications of paper bags and folding cartons in food packaging. | CO3 | U | 6 |
|  | b. | Write the working principle of co-extrusion process with a neat sketch. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain any two major types of labels used for foods and list the minimum information required on a label. | CO5 | A | 6 |
|  | b. | Explain in brief any two printing methods used to print films and papers. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Analyze the impact of different chemical pulping methods on the production of various types of paper. | CO3 | An | 9 |
|  | b. | Write any three applications of holographic labels. | CO5 | A | 3 |
|  |  |  |  |  |  |
| 23. | a. | Explain the press and blow process used in glass container manufacturing. | CO2 | A | 6 |
|  | b. | Assess all the surface treatments for improving the strength of glass containers. | CO2 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Assess the impact of active packaging technologies on food safety, quality, and sustainability. | CO6 | E | 9 |
|  | b. | List the factors influencing the selection of antimicrobial packaging materials. | CO6 | U | 3 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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



**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **20FP2030** | **Duration** | **3hrs** |
| **Course Title** | **FOOD PLANT UTILITY SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Provide the permissible limit for the lead content in water. | | CO1 | R | 1 |
| 2. | List any two minerals that commonly contribute to the hardness of water. | | CO1 | R | 1 |
| 3. | State the pressure output range available for water-tube boilers. | | CO3 | R | 1 |
| 4. | Recall how often maintenance of the firebrick refractory system is typically required for fire-tube boilers. | | CO3 | R | 1 |
| 5. | State the primary function of a pump in food processing. | | CO2 | U | 1 |
| 6. | Identify the most suitable type of pump for high-viscosity fluids. | | CO2 | R | 1 |
| 7. | Name any two types of power transmission systems used in food plants. | | CO4 | R | 1 |
| 8. | Interpret the solid waste management hierarchy. | | CO5 | R | 1 |
| 9. | Identify the maximum allowable belt speed for the transportation of grains. | | CO6 | R | 1 |
| 10. | State the primary advantage of using a screw conveyor in handling grains. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the significance of water quality in the food industry. | | CO1 | U | 3 |
| 12. | List two boiler accessories and describe their functions. | | CO3 | R | 3 |
| 13. | Describe the working principle of diaphragm pumps. | | CO2 | U | 3 |
| 14. | Write the significance of lubrication in mechanical power transmission systems. | | CO4 | A | 3 |
| 15. | Explain the impact of improperly managed waste on humans. | | CO5 | U | 3 |
| 16. | List the maintenance required for the screw conveying system. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Classify and explain the different methods of treatment of water supplies. | CO1 | An | 8 |
|  | b. | Explain the ion exchange technique in water treatment. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. |  | Explain the construction and working principle of a fire tube boiler. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Compare centrifugal pumps and positive displacement pumps in terms of working principle, and applications. Write its advantages and disadvantages. | CO2 | U | 8 |
|  | b. | A boiler generates 7200 kg of steam per hour at 9 bar and 0.91 dry from feed water at 36 ºC. The boiler uses 810 kg of coal per hour having a calorific value of 30,000 kJ/kg. Calculate the efficiency of the boiler. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Explain in detail the different types of power transmission systems used in food plants. | CO4 | U | 6 |
|  | b. | Assess the role of modern technology in mechanical power transmission systems. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain any one type of compressor used in food processing industries, with a neat sketch. | CO2 | A | 6 |
|  | b. | Describe the working principles and construction of a centrifugal pump. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Explain sludge and wastewater disposal systems for food plants. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Describe the principle and steps involved in the design of belt conveyor for material handling in food plants. | CO6 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Describe the screw conveying systems used in food processing industries. | CO6 | U | 8 |
|  | b. | Explain the criteria for the selection of material handling using slot conveyor and Bucket elevators. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Classify industrial water and water treatment processes. |
| **CO2** | Understand the working principle of pumps and their applications. |
| **CO3** | Apply their knowledge on working principle of steam generators and measurement of performance. |
| **CO4** | Analyze the various power transmission elements and their design. |
| **CO5** | Evaluate food effluent treatment plants. |
| **CO6** | Design and construct various material handling systems. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20FP2032** | **Duration** | **3hrs** |
| **Course Title** | **BAKERY, BEVERAGES AND CONFECTIONERY TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the particle size of refined wheat flour*.* | | CO1 | R | 1 |
| 2. | Mention the desirable Hagberg falling number for a flour for biscuit manufacture. | | CO1 | U | 1 |
| 3. | Relate the addition of potassium sorbates to cakes | | CO4 | A | 1 |
| 4. | Name a leavening agent used in biscuits | | CO2 | R | 1 |
| 5. | Sketch the SJM formula for sugar cane gradation. | | CO3 | A | 1 |
| 6. | Recall the concept of the process of *remontage*. | | CO5 | R | 1 |
| 7. | X prepares a grape juice of 24 ⸰brix. Determine the amount of alcohol generated, assuming that the final product has soluble solids of 6 ⸰brix. | | CO4 | A | 1 |
| 8. | If a distilled spirit label mentions 70 ⸰proof v/v, calculate the alcohol concentration. | | CO4 | A | 1 |
| 9. | Recall an example for a non-congeneric distilled spirit. | | CO5 | R | 1 |
| 10. | Outline the reasons for ***doctoring*** of hard-boiled candy. . | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the method of estimation of gluten in 100 words. | | CO2 | U | 3 |
| 12. | Mr. X wants to manufacture a multigrain bread with a proper loaf volume. Identify any three solutions to get a multigrain bread of good loaf volume. | | CO2 | A | 3 |
| 13. | Explain the process of compound imbibition in sugar cane milling in 100 words. | | CO4 | U | 3 |
| 14. | Summarize the process of wort preparation in 100 words. | | CO4 | E | 3 |
| 15. | Provide an example for a) Natural low calorie sweetener and b) Humectant for a sugar – free carbonated beverage. | | CO6 | A | 3 |
| 16. | Identify the reasons for fat-bloom in toffees. | | 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. |  | Illustrate in detail the steps involved in the manufacture of “refined flour” from wheat grains. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Evaluate any three reasons for – a. sunken cake and b. cake with large holes. | CO2 | An | 6 |
|  | b. | Mr. X. needs consultation on the manufacture of high fiber cookies with artificial sweeteners. He wants it also to be as close to the market samples. Suggest suitable additives and justify your choice in 300 words. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe in detail the process of defecation of sugarcane juice using lime in 500 words. | CO3 | U | 7 |
|  | b. | Explain the functioning of a crystalliser used in sugar manufacture in 300 words. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 20. |  | Mr. Y plans to set up a company manufacturing Sherry wine. He wants to use bananas for the same. Propose a suitable appropriate technology for the same and justify your selection. (in 800 words.) | CO6 | C | 12 |
|  |  |  |  |  |  |
| 21. |  | Devise a suitable technology for the manufacture of a low-calorie cola-based carbonated beverage using natural sweeteners in 800 words. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Devise a suitable technology for the manufacture of vegan cakes, justifying the selection of each of the ingredients in 800 words. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain any one method for continuous production of mango flavored hard-boiled candies in 800 words. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Propose appropriate technology for the manufacture of sugar-free dark chocolates, justifying the choice of each ingredient in 800 words. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Gain knowledge on the ingredients, process and machinery involved in bakery, confectionery and beverage technology. |
| **CO2** | Understand the factors affecting the quality of baked and confectionery products. |
| **CO3** | Apply gained knowledge in manufacturing of new 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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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **20FP2034** | **Duration** | **3hrs** |
| **Course Title** | **MEAT, POULTRY AND FISH PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the chemicals that are injected to prevent PSE. | | CO1 | R | 1 |
| 2. | Name the protein present in red meat in significant amount. | | CO1 | R | 1 |
| 3. | Recall the bacteria that cause greening in sausage. | | CO2 | R | 1 |
| 4. | Mention the CO2 concentration used for stunning animals. | | CO2 | R | 1 |
| 5. | Name an emulsifying agent used in meat emulsion for sausage. | | CO3 | R | 1 |
| 6. | List a meat curing agent that gives a pink color to the cured meat. | | CO3 | R | 1 |
| 7. | Give an example of bacteria that are important in poultry. | | CO4 | U | 1 |
| 8. | Infer the cleaning methods used in poultry processing industries. | | CO4 | R | 1 |
| 9. | Recall TWO proteins present in egg white. | | CO5 | R | 1 |
| 10. | Mention the compound that imparts a bitter taste in the fish muscle. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Differentiate between red meat and white meat. | | CO1 | U | 3 |
| 12. | Define exsanguination. How will you differentiate this with haemorrhage. | | CO2 | R | 3 |
| 13. | Outline the significance of intermediate moisture foods. | | CO3 | R | 3 |
| 14. | Define Modified Atmosphere Packaging and mention its importance. | | CO4 | R | 3 |
| 15. | Write THREE factors affecting the quality of eggs. Explain in short. | | CO5 | A | 3 |
| 16. | Define the Chilled Seawater System and mention its advantages. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the composition of meat and the importance of meat modifiers. | CO1 | U | 8 |
|  | b. | Write a short note on myoglobin in 200 words. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate the slaughtering process of cattle with a neat flow diagram. | CO2 | U | 6 |
|  | b. | Explain the HACCP principles of a meat processing plant. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe the canning of meat with a neat flow diagram. | CO3 | U | 6 |
|  | b. | Explain the processing steps of bacon with a neat sketch. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. |  | Explain the slaughtering process of poultry and the quality characteristics of poultry meat. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | Describe the structure, composition, and nutritive value of egg. | CO5 | A | 6 |
|  | b. | **Summarize** the steps involved in the processing of whole egg powder and mention the advantages and disadvantages. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Differentiate between slow freezing and fast freezing of meat in terms of their quality characteristics. | CO3 | An | 6 |
|  | b. | **Compare** different methods of curing meat and highlight the role of each ingredient in preserving the meat. | CO3 | E | 6 |
|  |  |  |  |  |  |
| 23. | a. | Write short notes on poultry plant sanitation. | CO4 | A | 6 |
|  | b. | Explain the key microbial contaminants in poultry and their impact on food safety. | CO5 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the biochemical factors contributing to fish spoilage. | CO6 | A | 4 |
|  | b. | Illustrate the production process of fish protein concentrate (FPC) and its nutritional benefits compared to other protein sources. | CO6 | An | 8 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Describe the muscle structure related to physical and chemical properties. |
| **CO2** | Explain the slaughtering methods and carcass processing of different types of meats. |
| **CO3** | Demonstrate effective preservation methods for ensuring consumer safety. |
| **CO4** | Analyze meat quality with respect to HACCP and GMP of meat, poultry and fish processing. |
| **CO5** | Evaluate the quality of processed and preserved poultry and egg products. |
| **CO6** | Design layout for slaughter houses and meat processing units. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Express the unit of thermal conductivity in the SI system. | | CO1 | U | 1 |
| 2. | Define the coefficient of friction. | | CO1 | R | 1 |
| 3. | State any two objectives of cold storage. | | CO2 | R | 1 |
| 4. | Give two examples of primary refrigerants. | | CO2 | U | 1 |
| 5. | List any two organisms present in frozen foods. | | CO3 | R | 1 |
| 6. | Indicate the physical change that occurs during the freezing of food. | | CO3 | U | 1 |
| 7. | Label any two scrubbers used to remove oxygen in CAP. | | CO4 | R | 1 |
| 8. | Name the major deteriorative reaction considered in MAP modeling. | | CO4 | R | 1 |
| 9. | Identify the gas exchange mechanisms used in CAS systems. | | CO5 | U | 1 |
| 10. | Report any two storage pests common in stored grains. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Differentiate between bulk density and true density of grains. | | CO1 | An | 3 |
| 12. | Explain the role of the expansion valve used in the refrigeration system. | | CO2 | U | 3 |
| 13. | Describe glass transition temperature, highlighting its significance in frozen food storage. | | CO3 | R | 3 |
| 14. | Write short notes on the modified atmospheric storage (MAP) practiced in the shelf life extension of food. | | CO4 | U | 3 |
| 15. | Interpret the beneficial effects of Controlled Atmospheric Storage. | | CO5 | A | 3 |
| 16. | Compare chemical and nonchemical fumigation used in the storage of grains. | | 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. |  | Describe the thermodynamic properties of an air-water vapor system and their significance using the psychrometric chart. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Illustrate the different types of freezers used in the food industry. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the various aspects of cooling load calculation using suitable examples. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe the principle involved in Modified Atmosphere Packaging and its application. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the working principle of equipment used for producing and regulating controlled atmospheric storage with sketches. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | 680 kg of fish at 5 ° C are to be frozen and stored at 12 ° C. The specific heat of fish above freezing point is 3.182 kJ/kg K and below freezing point is 1.717 kJ/kg K. The freezing point is -2oC, and the latent heat of fusion is 234.5 kJ/kg. Calculate the quantity of heat that must be removed to cool the fish and the percentage of latent heat in the total cooling load. | CO3 | An | 8 |
|  | b. | Describe the properties and functions of secondary refrigerants. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 23. |  | Explain the functioning of various components present in the vapor compression refrigeration systems with sketches. | CO2 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Compare the advantages and disadvantages of traditional, improved, and modern grain storage structures. | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FP2037** | **Duration** | **3hrs** |
| **Course Title** | **FAT AND OIL PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name any one homogenous catalyst used in esterification of fats and oil. | | CO1 | R | 1 |
| 2. | Recall and write the method used to measure induction time of oxidation. | | CO1 | R | 1 |
| 3. | Name any two solvent most commonly used in solvent extraction. | | CO2 | R | 1 |
| 4. | Mention the temperature used in heating the fruitlets of palm fruit during fruit maceration process. | | CO2 | R | 1 |
| 5. | Indicate the moisture content for ghee. | | CO3 | U | 1 |
| 6. | State the purpose for degumming in oil refining. | | CO3 | R | 1 |
| 7. | Name of technology, that uses sensors to analyze and detect the aroma compounds in the oil and to quantify their concentration | | CO4 | R | 1 |
| 8. | Define the term peroxide value. | | CO4 | R | 1 |
| 9. | Indicate one effect of oxidation during storage of oil. | | CO5 | U | 1 |
| 10. | Identify the permissible amount of BHA for margarine. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write any two applications of saponification | | CO1 | A | 3 |
| 12. | Identify any two methods use to remove gossypol during extraction of cotton seed oil and explain. | | CO2 | U | 3 |
| 13. | Write the byproducts obtained during refining of oils | | CO3 | A | 3 |
| 14. | List three types of trans esterification process that occur in oil. | | CO4 | U | 3 |
| 15. | List the types of packaging materials used for oil. | | CO5 | R | 3 |
| 16. | Name the three cocoa butter alternatives. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Distinguish between vegetable oil and animal fat. | CO1 | E | 6 |
|  | b. | Examine the method used for nomenclature of fats and oils. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain the process of extraction of coconut oil. | CO2 | A | 6 |
|  | b. | Appraise the process of extraction of sunflower oil, with a suitable diagram. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the process involved in production of Vanaspati. | CO3 | An | 6 |
|  | b. | Illustrate the manufacturing process for butter. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Summarize the quality parameters used in edible oil industry. | CO4 | E | 6 |
|  | b. | Deduce various factors that lead to formation of flavors and off flavors. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Appraise the packaging requirements for ghee. | CO5 | An | 6 |
|  | b. | Illustrate the key features for packaging of edible oil. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Summarize the process of hydrogenation of oil along with advantages and disadvantages. | CO5 | U | 12 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| 23. | a. | **Analyze** the chemical reactions that take place during the frying of oil and their impact on food quality. | CO5 | An | 8 |
|  | b. | **Summarize**  the drawbacks of the Kries test | CO5 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | **Classify** the different categories of specialty fats and oils. Explain in detail. | CO6 | U | 6 |
|  | b. | **Investigate** the functional properties of shortening and how they influence baking and frying applications. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Recognize the importance of fats and oils in human diet. |
| **CO2** | Describe the manufacturing process of oils and fats. |
| **CO3** | Apply knowledge on manufacture to design alternate fats. |
| **CO4** | Analyze the quality attributes of oils and fats. |
| **CO5** | Defend the use of specialty fats to meet human dietary requirement. |
| **CO6** | Design suitable packaging materials for fats and oils |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Describe the seven key principles that underpin a safe food supply chain. | CO1 | U | 8 |
|  | b. | Illustrate with relevant examples the intrinsic and extrinsic factors that influence the overall quality assessment of food products. | CO2 | A | 8 |
|  |  |  |  |  |  |
| 2. | a. | Illustrate the hierarchical structure of FSSAI with a diagram and explain the roles of different levels. | CO2 | A | 8 |
|  | b. | According to the FSSAI Act 2006, list the common offences and their associated penalties for food business operators. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 3. | a. | Describe the scope and nature of Codex Standards. | CO3 | U | 8 |
|  | b. | Explain the important quality attributes with well-labeled diagram. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Illustrate the possible ways adulterants can enter the food supply chain. | CO4 | E | 8 |
|  | b. | Explain the step-by-step licensing procedure that food businesses must follow as mandated by the FSSAI Act, 2006. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 5. | a. | Describe the primary functions of the World Trade Organization (WTO) related to food safety and trade. | CO1 | U | 8 |
|  | b. | Examine the mandatory labeling requirements for pre-packaged food products as specified by FSSAI regulations. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Interpret with justification the Clause 10 within the ISO 22000:2018 standard, focusing on its requirements for food safety management. | CO5 | E | 8 |
|  | b. | Develop a HACCP plan by using 12 logical sequence steps for any one food industry. | CO5 | A | 8 |
|  |  |  |  |  |  |
| 7. | a. | Appraise the different categories of hazards that can occur in the food industry, along with examples of each category. | CO5 | A | 8 |
|  | b. | Describe the principles and practices of Integrated Pest Management (IPM) in food production. | CO2 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Explain the specific sub-clauses and sections of auditable Clause 8 of ISO 22000:2018 that are most relevant to the Dairy industry. | CO6 | U | 10 |
|  | b. | Develop a comprehensive planning report for establishing a millet processing industry, using Clause 7 of the ISO 22000:2018 standard as a guideline. | CO6 | C | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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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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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **22FP2050** | **Duration** | **3hrs** |
| **Course Title** | **INTELLIGENT FOOD INDUSTRIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the significance of the term density. | | CO1 | R | 1 |
| 2. | Define the term specific volume. | | CO1 | R | 1 |
| 3. | List any two physico-chemical hurdles. | | CO3 | R | 1 |
| 4. | List any two applications of Electrical flowmeters. | | CO3 | R | 1 |
| 5. | List the three basic types of pressure measuring instruments. | | CO3 | R | 1 |
| 6. | Name the diagram that represents phase transitions. | | CO3 | R | 1 |
| 7. | List any two factors on which the density of the food depends. | | CO3 | R | 1 |
| 8. | List any two benefits of SCADA. | | CO4 | R | 1 |
| 9. | Expand the acronym ANFIS. | | CO4 | R | 1 |
| 10. | Write the value of typical over run for ice cream. | | CO3 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the effect of heat on nutritional and sensory characteristics. | | CO1 | A | 3 |
| 12. | Explain the principle of operation of anyone sensor. | | CO3 | An | 3 |
| 13. | Write short notes on Automatic control in food industry. | | CO3 | A | 3 |
| 14. | Describe Optical sensing. | | CO3 | An | 3 |
| 15. | Explain any three components of automation system. | | CO2 | U | 3 |
| 16. | Summarize any three security and operation concerns in the usage of SCADA. | | CO4 | 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. | Explain in detail the effect of water activity on nutritional properties. | CO3 | A | 6 |
|  | b. | Describe the mechanisms of heat transfer. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 18. |  | Illustrate the current manufacturing procedures involving key technologies in dairy industry. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the application of sensors in   1. Energy management. 2. Inventory management | CO6 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain the role of WSN in   1. Precision agriculture. 2. Precision livestock farming. | CO6 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the automatic process control methods in chocolate industry. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Illustrate the joint processing of imprecision and variability in the modeling of cheese mass loss during ripening using ANN. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Examine the future of fuzzy logic in research related to food industry. | CO5 | A | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the application of recent intelligent technologies in Sea food industry. | CO2 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Identify the different key technologies used in the food industries. |
| **CO2** | Apply the robotics and automation in food industries |
| **CO3** | Apply scientific principles in the various food processing sectors. |
| **CO4** | Evaluate communication protocols used in the food industries |
| **CO5** | Designing of smart premises for food industries. |
| **CO6** | Analyze data received through the sensors in IoT. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Classify food items based on their pH, moisture content and suggest suitable preservation methods based on the classification. | CO1 | A | 10 |
|  | b. | Summarize the fundamental principles of food preservation, supported with relevant examples. | CO1 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare any two types of blanchers used in the food industry in terms of their working principles, advantages, limitations, and suitability for various food products. | CO2 | An | 10 |
|  | b. | Summarize the HTST pasteurization process using a plate heat exchanger, accompanied by a labeled sketch. | CO2 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | Describe any five types of freezers used in the food industry and suggest their suitable applications based on the nature of different food products. | CO3 | A | 10 |
|  | b. | Explain the effect of ice crystal formation on food texture and describe defects from improper freezing and thawing. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the spray drying process of liquid foods using a schematic diagram and discuss its advantages and disadvantages. | CO4 | An | 10 |
|  | b. | Illustrate the drying curve and explain the significance of the constant and falling rate periods regarding the drying of food materials. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Illustrate the mechanism of action of any five antimicrobial preservatives with their permissible limits in any five food products. | CO5 | E | 10 |
|  | b. | Explain the role of antioxidants as preservatives and suggest suitable antioxidants for any five food products. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the undesirable changes that occur in food due to spoilage and examine the intrinsic and extrinsic factors influencing the rate and type of food spoilage. | CO1 | An | 10 |
|  | b. | Describe extrusion cooking using a schematic diagram and explain the application of various extruders, providing examples. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Evaluate the principles, advantages, and limitations of slow and fast freezing methods with suitable examples. | CO3 | E | 10 |
|  | b. | Compare solar drying and tray drying by evaluating their principles, efficiency, advantages, and disadvantages using a schematic diagram. | CO4 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Illustrate the processing of food products using pulsed light technology with a suitable example. | CO6 | A | 10 |
|  | b. | Explain the use of antibiotics as food preservatives by examining their mode of action and permissible limits for different food products. | CO5 | An | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the principle of the food irradiation technique with a suitable example. | CO6 | An | 10 |
|  | b. | Illustrate the principle of hurdle technology in food preservation with suitable examples. | CO6 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Rheology. Explain in detail any two dough rheological tests and their measurement with graphs. | CO1 | R | 10 |
|  | b. | Summarize the physical and chemical factors influencing wheat quality and their impact on flour production and end-product quality. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the role of the following in influencing the textural properties of baked products. a) eggs in cakes b) shortenings in biscuits. | CO2 | U | 10 |
|  | b. | Explain in detail the role of the following leavening agents  a) double acting baking powder in cakes. b) Yeast in bread. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write about the importance of each stage in the biscuit manufacturing process and illustrate it with a labeled flowchart. | CO3 | A | 10 |
|  | b. | Illustrate the various steps involved in the manufacture of multi-grain bread by sponge and dough process. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Summarize the advancements in noodle production technology and their impact on product quality, processing efficiency, and nutritional attributes. | CO4 | A | 10 |
|  | b. | Illustrate the principles and technology of rice flaked products with flowchart. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Classify sugar-based confectionery based on their constituents. | CO5 | U | 5 |
|  | b. | Summarize the role of sucrose and glucose syrup in contributing to the texture of hard-boiled candies. | CO5 | A | 5 |
|  | c. | Illustrate the steps involved in the manufacturing of hard-boiled candy. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | i) Discuss the secondary processing of cocoa beans. | CO6 | U | 7 |
|  |  | ii) Summarize the steps involved in the manufacture of jujubes. | CO6 | U | 3 |
|  | b. | Differentiate between the toffee manufacturing process followed for a hard toffee and a soft toffee, illustrating it with a flowchart. | CO6 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the difference between *maida* and *suji rawa* in terms of their FSSAI and BIS specifications. | CO1 | A | 10 |
|  | b. | Compare and contrast cookies, crackers, and biscuits based on their texture and ingredients. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 8. | a. | Explain in detail the importance of  a) dough conditioners in bread b) Texture enhancers in cakes. | CO2 | U | 10 |
|  | b. | Summarize the principles and technology of millet flaked products with a flowchart. | CO4 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | i) Explain the primary processing of cocoa beans. | CO6 | U | 7 |
| ii) Describe the flowchart demonstrating the manufacturing process of jellies. | CO6 | R | 3 |
|  | b. | Explain the process of manufacture of dark chocolates and illustrate it with a flowchart. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Analyze the cup characteristics of *C. arabica* and *C. robusta* coffee. | CO1 | An | 10 |
|  | b. | Explain the roasting process of coffee beans and physicochemical changes during roasting. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate all the steps involved in Instant coffee production. | CO2 | A | 10 |
|  | b. | Compare different decaffeination methods based on their impact on the sensory properties of instant tea or soluble tea. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Describe different flavor incorporation methods in tea processing to enhance its aroma and taste. | CO6 | A | 10 |
|  | b. | Explain the steps involved in instant tea production with a neat flow diagram. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Summarize the roasting process of cocoa beans and physicochemical changes during roasting. | CO3 | E | 10 |
|  | b. | Analyze the role of mixing and refining in achieving the desired texture and consistency in chocolate manufacturing. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Assess all the roles of fat and sugar in chocolate manufacturing process. | CO1 | E | 10 |
|  | b. | Summarize the steps involved for aroma development in vanilla. | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Interpret step-by-step processing techniques to convert raw coconut into various value-added products. | CO6 | A | 10 |
|  | b. | Compare any two roasting methods used for cashew nut. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain any two methods of extraction of essential oils from major spices. | CO5 | A | 10 |
|  | b. | Apply suitable extraction methods to produce oleoresin from major spices. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain in detail about post harvest processing of turmeric and its quality specification. | CO4 | An | 10 |
|  | b. | Implement appropriate processing techniques to produce primary and secondary ginger products. | CO4 | A | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the production of black pepper, white pepper and ground pepper. | CO4 | U | 10 |
|  | b. | Summarize all the steps involved in the garlic dehydration process with flowchart. | CO4 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the physicochemical properties of milk. | CO1 | A | 10 |
|  | b. | Interpret the following milk tests for adulteration, heat, and microbial stability. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Summarize the milk homogenization process and its impact on milk quality. | CO2 | E | 10 |
|  | b. | Describe the process of clarification and filtration of milk with a highlight on the working principle of a milk clarifier using a neat schematic diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the production process of Extended shelf life milk with a neat flow diagram. | CO3 | An | 10 |
|  | b. | Summarize the spray-dried whole milk powder production process using a process flowchart. | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate the working of a centrifugal cream separator with a schematic diagram. | CO4 | A | 10 |
|  | b. | Explain the working principle of a drum drier using a schematic diagram. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the types of milk fillers based on their working principles, applications, advantages, and limitations. | CO5 | An | 10 |
|  | b. | Explain the common ice cream defects, causes, and suitable corrective measures for each type of defect. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the milk reception process using a schematic diagram. | CO1 | An | 10 |
|  | b. | Compare LTLT and UHT milk pasteurization by analyzing principles, processing conditions, advantages, and limitations with a schematic diagram. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the steps involved in the manufacture of ice cream using a process flowchart. | CO3 | A | 10 |
|  | b. | Compare the working principles of a clarifier and a bactofuge using a schematic diagram. | CO4 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Compare the production process of Dahi and Yogurt with a process flow chart. | CO6 | E | 10 |
|  | b. | Explain the operations involved in the packaging and storage of cheddar cheese. | CO5 | A | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Summarize and explain the types and process of Khoa production using a flow chart. | CO6 | A | 10 |
|  | b. | Describe the production process of Rasgulla using a flow chart and the factors that affect the texture, sponginess, and quality. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Gain knowledge of the properties and composition of milk. |
| CO2 | Understand the processing techniques of milk. |
| CO3 | Learn the different milk products manufacturing. |
| CO4 | Understand the equipment used in dairy product manufacturing. |
| CO5 | Learn the packaging and storage of various milk products. |
| CO6 | Acquire knowledge of Indian dairy products and their manufacturing. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | **Analyze** the biochemical changes occurring in muscle during **post-mortem muscle chemistry** and **assess** their impact on meat quality. | CO1 | An | 10 |
|  | b. | **Explain** the **meat composition of different species** and **the** factors influencing their nutritional value. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | **Explain** the **slaughtering process of pigs** and its impact on meat yield and quality. | CO2 | A | 10 |
|  | b. | **Identify** and explain the key **operational factors affecting the meat quality** with a **justification** to maintain the high standards. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | **Examine** the **salient features of ISO 22000** and its importance in ensuring food safety in the meat industry | CO3 | A | 10 |
|  | b. | **Illustrate** the manufacturing process of fresh sausages. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | **Explain the** slaughtering **methods of poultry with a neat flow chart.** | CO4 | An | 10 |
|  | b. | **Examine** the sources of **contamination** and control measures to enhance the microbial safety in poultry meat. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | **Describe** the **process of spray-dried whole egg powder** and mention its advantages in food processing sector. | CO5 | U | 10 |
|  | b. | **Explain** the structure and functional properties of egg with a neat diagram. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | **Explain** the **fish oil extraction process** and its nutritional significance. | CO6 | A | 10 |
|  | b. | **Analyze** the impact of **freezing on fish meat** texture, quality, and shelf life. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | **Explain** the **fish canning process** and its role in extending the shelf life of seafood products. | CO6 | A | 10 |
|  | b. | **Describe** the **freezing methods followed for prawns and shrimps.** | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | **Explain** the **stunning methods** used for slaughtering different species of animals. | CO2 | An | 10 |
|  | b. | **Identify** the key **quality parameters of eggs** to assess their freshness. | CO5 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | **Analyze** the **factors influencing the fish quality** during chilling process. | CO6 | An | 10 |
|  | b. | **Explain** the **individual quick freezing of prawns.** | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | - | 20 | - | - | 20 |
| CO2 | - | 10 | 10 | 10 | - | - | 30 |
| CO3 | - | - | 10 | 20 | - | - | 30 |
| CO4 | - | - | 10 | 10 | - | - | 20 |
| CO5 | - | 20 | 10 | - | - | - | 30 |
| CO6 | - | 10 | 30 | 10 | - | - | 50 |
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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the levels of packaging and the environment for which a packaging material is designed. | CO1 | U | 10 |
|  | b. | State the reasons for food spoilage, highlighting the rationale behind packaging. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Analyze the mechanism of heat and mass transfer in packaging materials. | CO2 | An | 10 |
|  | b. | Interpret the tests used for measuring the travel worthiness of a packaging material. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the Draw-and-wall-iron (DWI) and Draw-and-redraw (DRD) process of manufacturing aluminum cans. | CO3 | A | 10 |
|  | b. | Describe the Bag-on-valve system used in the manufacture of aerosol cans with sketches. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate the Blow and blow (B&B) and Press and blow (P&B) process of manufacturing glass containers. | CO3 | A | 10 |
|  | b. | Explain the various surface treatments used to improve the strength and finish of glass containers. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Classify polymers used in food packaging. Explain any two in detail. | CO3 | An | 10 |
|  | b. | Indicate the product characteristics for assessing the shelf life of the food commodity. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the various converting process used in the manufacture of paper. | CO4 | U | 10 |
|  | b. | Interpret the need for labelling with respect to manufacturers perspective. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the zeroth order reaction prediction used to estimate the shelf-life of food products. | CO5 | An | 10 |
|  | b. | Classify the different types of glass and glass materials used in the manufacture of food packaging systems. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Design a label for a gummies pack, highlighting the mandatory and voluntary information required as per consumer and legislative need. | CO5 | C | 10 |
|  | b. | Compare the various mechanical methods to test the packaging materials. | CO6 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the smart and intelligent Packaging systems used in food supply chain management. | CO6 | An | 10 |
|  | b. | Describe the controlled atmosphere storage of foods with sketches. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **23FP1002** | **Duration** | **3hrs** |
| **Course Title** | **BAKERY BEVERAGES AND CONFECTIONARY TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the primary function of a dough mixer in a bakery. | | CO1 | U | 1 |
| 2. | Mention the purpose of the moisture test in wheat quality testing. | | CO1 | R | 1 |
| 3. | Identify the primary difference between straight dough fermentation and sponge and dough method in bread making. | | CO2 | R | 1 |
| 4. | Name the main ingredient in biscuit dough that influences its texture and consistency. | | CO2 | R | 1 |
| 5. | Name one unit operation involved in the sugar manufacturing process. | | CO3 | U | 1 |
| 6. | Write the main use of molasses in the sugar industry. | | CO3 | R | 1 |
| 7. | Recall the the primary fermentation agent used in beer production. | | CO4 | U | 1 |
| 8. | Summarize the role of yeast in the production of wine. | | CO4 | R | 1 |
| 9. | Recall the significance of water polishing in the production of carbonated beverages. | | CO5 | U | 1 |
| 10. | Identify the role of total solids in determining the string consistency of confectionery products. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Assess the Farinograph to check the dough rheology and its importance in the baking process. | | CO1 | An | 3 |
| 12. | Explain the significance of dough consistency in biscuit production and how it affects the final product. | | CO2 | U | 3 |
| 13. | Appraise the impact of energy and material balance on the efficiency of the cane sugar process. | | CO3 | An | 3 |
| 14. | Explain the importance of temperature control during the fermentation process in the production of wine and beer. | | CO4 | U | 3 |
| 15. | Analyze the differences between sugar-free and sugarless carbonated beverages in terms of formulation and quality aspects. | | CO5 | An | 3 |
| 16. | Discuss the key differences in the production processes of toffees and chocolates. | | 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. |  | Discuss the different wheat quality tests, including the moisture test and grain hardness testing, and how these tests influence the milling process and the final product quality. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Designate the different types of biscuit dough and their characteristics, and how these doughs impact the texture and quality of biscuits. | CO2 | U | 6 |
|  | b. | Deliberate the process of bread staling, its causes, and methods to prevent it during bread production. |  | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Apply the principles of sugar plant sanitation in maintaining the quality of sugar produced, and discuss how recent trends in sugar cane technology can contribute to improved sustainability in sugar production. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Analyze the key quality characteristics that distinguish beer, wine, and champagne, and explain how their production processes impact these qualities. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Evaluate the importance and impact of probiotic beverages in the food and beverage industry, considering their health benefits, production methods, and market trends. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | Describe the role of dough rheology in bakery production and how equipment like the Dough Mixer, Dividers, Rounders, Proofing units, and Ovens are used in controlling dough properties to ensure consistent product quality. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Analyze the role of ingredients in the manufacturing process of cakes and how variations in these ingredients (e.g., flour type, fat content, and sugar) affect cake quality. | CO2 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Analyze the quality aspects of aerated confectionery and the technological challenges involved in their production. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Evaluate the quality standards of ingredients and machinery in bakery industry |
| **CO2** | Standardize the factors influencing the production of baked products. |
| **CO3** | Evaluate unit operations in Sugar manufacture. |
| **CO4** | Analyze the quality characteristics of distilled beverages. |
| **CO5** | Assess the process involved in the production of non-alcoholic beverages for quality control. |
| **CO6** | Develop newer processes and nutritious products that are economically viable |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **23FP2008** | **Duration** | **3hrs** |
| **Course Title** | **UNIT OPERATIONS IN FOOD PROCESSING - I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define effectiveness of screen. | | CO1 | R | 1 |
| 2. | Mention the use of screening. | | CO1 | R | 1 |
| 3. | Convert 20% wet basis moisture content to dry basis moisture content. | | CO2 | A | 1 |
| 4. | Define Equilibrium Moisture Content (EMC). | | CO2 | R | 1 |
| 5. | State Rittinger’s law. | | CO3 | U | 1 |
| 6. | Define specific cake resistance. | | CO3 | R | 1 |
| 7. | Dfifferentiate continuous phase from dispersed phase. | | CO4 | U | 1 |
| 8. | Indicate the disadvantages of plate and frame filter press. | | CO4 | R | 1 |
| 9. | Define centrifuge effect in separations. | | CO5 | U | 1 |
| 10. | List any two applications of gas – liquid mixing in food processing. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Air carrying particles of density 1200 kg/m3 and an average diameter of 25 micron enters a cyclone of 600 mm diameter at a linear velocity of 20 m/s. Calculate the centrifugal force acting radially in the cyclone and the separation factor of the cyclone. | | CO1 | An | 3 |
| 12. | List the mechanisms proposed to describe the drying in capillary porous products. | | CO2 | U | 3 |
| 13. | Summarize the different types of size reduction with examples. | | CO3 | U | 3 |
| 14. | An emulsion of oil in water has oil droplets in the form of spheres of average diameter of 10 microns. The specific gravity of oil is 0.95. Find the raised velocity of the oil globules. ( µ = 1 x10-3 Pa.s and density of water = 1000 kg/m3). | | CO4 | U | 3 |
| 15. | A bowl centrifuge is used to separate a solid suspension. The centrifuge has discharge radii of 8 cm and 10 cm. If the density of solid is 1050 kg/m3, and the mother liquid is water, calculate the neutral zone so that the feed inlet may be designed. | | CO5 | An | 3 |
| 16. | Sketch any three types of agitators used for liquid mixing. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the construction and working of single and double drum rotary screen cleaner with a diagram. | CO1 | U | 7 |
|  | b. | During the evaluation of an air screen cleaner with two screens the following observations were made.  The impurities present in feed were 6.5%   1. The impurities present in clean grain were 0.5%. 2. The outflow of blower contained 0.2% clean seed. 3. The overflow of the first screen contained 1% clean seed. 4. The underflow contained 0.5% clean seed.   Evaluate the cleaning efficiency of the cleaner. | CO1 | E | 5 |
|  |  |  |  |  |  |
| 18. | a. | Interpret any two direct methods of moisture measurements. | CO2 | A | 6 |
|  | b. | A farmer produces 12 tons of paddy which is at a moisture content of 24% (w.b), and needs to dry it to 14% (w.b) moisture content. Recommenda suitable dryer for drying paddy and explain its working principle. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 19. | a. | In a sorghum milling experiment it was found that to grind 4.4 mm sized grains to IS sieve 30 (0.296) mm opening, the power requirement was 5 kW. Calculate the power requirement for the milling of sorghum by the same grinder to IS sieve 25 (0.251mm opening) using i. Rittinger’s law and ii. Kick’s law. Feed rate of milling is 150 kg/hr. | CO3 | E | 7 |
|  | b. | Appraise the role of size reduction process in the food industry. | CO3 | An | 5 |
|  |  |  |  |  |  |
| 20. | a. | Derive an expression for finding the terminal velocity of a settling particle in a sedimentation process. | CO4 | C | 6 |
|  | b. | Describe the working of rotary drum vacuum filter press with a diagram and mention its advantages. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | A centrifuge is used for the separation of a coagulated protein from a solution fed at the rate of 30 lpm. The solids have an average particle size of 100 µm and their density is 1010 kg/m3, while the density of mother liquid is 1000 kg/m3, and viscosity is 1 x 10-3 Pa.s. Calculate the Sigma factor of the centrifuge. If the centrifuge spins at 5000 rpm, and if effective separation takes place at a radius of 5cm, calculate the velocity of settling of a particle. | CO5 | A | 7 |
|  | b. | Describe the working of basket type centrifuge with a sketch. | CO5 | U | 5 |
|  |  |  |  |  |  |
| 22. |  | A fruit pulp is treated with a pectinase enzyme to get clear juice and is filtered using a Plate and Frame filter press to clear it from suspended and fibrous materials. The total filtration area is 1 m2. The following data on volume Vs time is obtained at 25℃ keeping the pressure drop of 0.1 MN/m2 (gauge).    The slurry contains 25g of solids per liter and the density of the solid is 900 kg/m3. Calculate the specific cake resistance and equivalent cake thickness. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Classify the size reduction processes and describe the working of any two various size reduction equipment. | CO3 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the working of planetary mixer and kneader with a suitable diagram. | CO6 | A | 7 |
|  | b. | A vitamin premix of 1 kg is added to 999 kg of a food supplement. After mixing for some time in a blender, five samples each of 100 g are collected and analysed for the vitamin premix. The following are the results of each sample in g.  0.11, 0.098, 0.09, 0.105, 0.12,  Find the standard deviation and the variance. | CO6 | E | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | To identify the suitable screening techniques for quality gradation of agricultural materials. |
| **CO2** | To understand the principle and operation of different types of dryers. |
| **CO3** | To examine the benefits, problems and energy requirements of size reduction operations. |
| **CO4** | To select suitable process technology for mechanical separation in food systems. |
| **CO5** | To assess the application of centrifugal separation in food materials. |
| **CO6** | To apply mixing principles for mixing dry powders and low or high viscous liquids. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **23FP2011** | **Duration** | **3hrs** |
| **Course Title** | **FOOD STANDARDS AND REGULATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the examples of class II preservatives. | | CO1 | U | 1 |
| 2. | List the common adulterants in milk. | | CO1 | U | 1 |
| 3. | Expand FSSAI. | | CO2 | R | 1 |
| 4. | Recall the penalty amount imposed for selling the food not of its original nature. | | CO2 | R | 1 |
| 5. | Identify the quality attributes in defining the quality of foods. | | CO3 | R | 1 |
| 6. | State Food Labelling. | | CO3 | R | 1 |
| 7. | Define food inspection. | | CO4 | R | 1 |
| 8. | Recall 5S methodology. | | CO4 | R | 1 |
| 9. | Define carbon footprint. | | CO5 | R | 1 |
| 10. | Identify the National Codex contact point of India. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain physical, chemical, and biological hazards. | | CO1 | U | 3 |
| 12. | List the offenses that lead to penalties imposed on an individual by FSSAI. | | CO2 | U | 3 |
| 13. | Outline the key challenges in food labeling. | | CO3 | An | 3 |
| 14. | Differentiae ISO:22000 and HACCP. | | CO4 | Ap | 3 |
| 15. | Explain the functions of WTO. | | CO5 | U | 3 |
| 16. | Show the functions of shadow committee. | | 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 naturally occurring contaminants and the contaminants in food. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate the role of FSSAI. | CO2 | An | 6 |
|  | b. | List and explain the responsibilities of Food Business Operators. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Categorize the methods involved in determining the quality of food. | CO3 | An | 6 |
|  | b. | Categorize the testing procedures in determining the water quality. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. |  | Demonstrate the procedure involved in developing the HACCP plan. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Explain the basic rights and obligations of SPS agreement. | CO5 | U | 6 |
|  | b. | Explain the mission of World Animal Health Organization (OIE). | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the methodology involved before doing the sensory test. | CO3 | U | 6 |
|  | b. | Outline the benefits of ISO:22000. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 23. | a. | List the steps to ensure cleanliness and hygiene in the godowns/warehouses. | CO1 | U | 6 |
|  | b. | Analyze the role of food additives. | CO1 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe the core function and responsibilities of National Codex Committee. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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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 offenses 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 ISO22000:2018 standards. |
| **CO6** | Design new food safety management systems or innovative norms for the safety of foods. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **23FP2019** | **Duration** | **3hrs** |
| **Course Title** | **BAKERY AND BEVERAGES AND CONFECTIONERY TECHNOLOGY FOR BEGINNERS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Indicate the protein percentage for all-purpose flour. | | CO1 | U | 1 |
| 2. | Indicate the purpose of farinograph. | | CO1 | R | 1 |
| 3. | Cite the optimal fermentation temperature for bulk fermentation during straight dough fermentation process. | | CO2 | U | 1 |
| 4. | State one preservative used in bakery products. | | CO2 | R | 1 |
| 5. | State the composition of baking powder. | | CO3 | R | 1 |
| 6. | Indicate the baking temperature for biscuits. | | CO3 | R | 1 |
| 7. | Define sugar free beverages. | | CO4 | R | 1 |
| 8. | Indicate any two coloring agents used in carbonated beverages. | | CO4 | R | 1 |
| 9. | Give example of any two non-crystalline confectionery products. | | CO5 | U | 1 |
| 10. | Indicate the acceptable limit of milk protein for toffee. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List any four physical properties used as quality parameters for wheat. | | CO1 | R | 3 |
| 12. | Give any two examples for humectants that are used as additive in bakery industry. | | CO2 | U | 3 |
| 13. | List all the types of biscuit dough and briefly describe anyone. | | CO3 | R | 3 |
| 14. | Give examples of any two stabilizers used in carbonated beverages and their functions. | | CO4 | U | 3 |
| 15. | Explain the quality aspects of aerated confectionery products. | | CO5 | U | 3 |
| 16. | Write the composition of dark chocolate and milk chocolate. | | 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. | Summarize all the chemical parameters considered for wheat quality. | CO1 | R | 6 |
|  | b. | Describe the equipment used in bakery industry. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate all the steps involved in manufacture of bread by sponge and dough process | CO2 | A | 6 |
|  | b. | Explain any three bread faults indicating reasons and causes. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Write the importance of each stage in the biscuit manufacturing process and illustrate it with a labeled flow chart. | CO3 | An | 6 |
|  | b. | Illustrate the process of manufacturing of cake with the help of flowchart. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the manufacturing process of carbonated beverages. | CO4 | A | 6 |
|  | b. | Summarize the major functions of food additives in beverages. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate the manufacturing process of Hard-boiled candy with the help of flowchart. | CO5 | An | 6 |
|  | b. | Describe the various stages of Toffees.. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Illustrate dough rheology and its measurement techniques. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Differentiate between cookies, crackers and biscuits. | CO4 | An | 6 |
|  | b. | Summarize the technological innovations in marshmallow production. | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate the process of manufacturing of chocolates with the help of flowchart. | CO6 | U | 6 |
|  | b. | Appraise the various quality aspects required for chocolates. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Summarize the quality standards of ingredients in the bakery, beverages and confectionery industry. |
| **CO2** | Identify the factors influencing the production of baked products. |
| **CO3** | Evaluate the quality of baked products. |
| **CO4** | Relate the composition with the quality of beverages. |
| **CO5** | Identify and improve the quality of confectionery products. |
| **CO6** | Develop newer processes and nutritious products that are economically viable. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **23FP2036** | **Duration** | **3hrs** |
| **Course Title** | **MECHANICAL SYSTEMS FOR FOOD PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define the characteristic of vane pump. | | CO1 | R | 1 |
| 2. | Define torque. | | CO1 | R | 1 |
| 3. | Identify the pump that conveys fruits and vegetables in water. | | CO2 | R | 1 |
| 4. | List any two factors affecting the power transmission in belt drive. | | CO2 | R | 1 |
| 5. | Identify the energy conversions in the boilers used in steam generation. | | CO3 | R | 1 |
| 6. | State boiler efficiency. | | CO3 | R | 1 |
| 7. | Define the term “temperature glide”. | | CO4 | R | 1 |
| 8. | List any two safe refrigerants according to German Federal Authority of the Environment. | | CO4 | R | 1 |
| 9. | List any two factors that influence the rate of heat transfer during freezing. | | CO5 | R | 1 |
| 10. | Identify the refrigerant and absorbent in ammonia-water and water LiBr type vapour absorption refrigeration systems. | | CO4 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Classify centrifugal pumps based on flow. | | CO1 | U | 3 |
| 12. | Describe any three properties of materials suitable for shafts. | | CO2 | U | 3 |
| 13. | Interpret the term boiler performance. | | CO3 | A | 3 |
| 14. | Explain the desirable and undesirable consequences of chilling temperature. | | CO5 | U | 3 |
| 15. | Classify the types of nucleation during freezing. | | CO5 | U | 3 |
| 16. | Explain the limitations of using pneumatic conveyors. | | 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. | Recommend the applications of a centrifugal pump in food processing. | CO1 | E | 8 |
|  | b. | A diagram of a liquid storage tank  Description automatically generated with medium confidence  Calculate the total head for the given setup. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. |  | Classify the different types of belt drives along with the materials used in its construction. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Compare water tube boilers with fire tube boilers. | CO3 | An | 6 |
|  | b. | An oil fuel of calorific value (heat value) 44700 KJ/kg burnt in a boiler with air fuel ratio of 20:1. Neglect losses and assume that all heat of combustion is given to products of combustion and specific heat of poc is 1.08. Boiler room temp is 38℃. Calculate max temp attained by the furnace. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the changes in quality and shelf life of the product that occur during chilling. | CO5 | A | 6 |
|  | b. | Explain the desirable properties of a primary refrigerant. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate the components of freezing curve with a graph. | CO5 | A | 6 |
|  | b. | Explain the various freezing methods used in the food industry. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Five-centimeter potato cubes are individually quick frozen (IQF) in a blast freezer operating at -40℃ and with a surface heat transfer coefficient of 30 Wm-2K-1. If the freezing point of the potato is measured as -1.0℃ and the density is 1180 kg m-3, calculate the expected freezing time for each cube. If the cubes are then packed into a cardboard carton measuring 20 cm x 10 cm x 10 cm, calculate the freezing time. Also calculate the freezing time for IQF freezing of 2.5 cm cubes.  (Additional data: the thickness of the card is 1.5 mm, the thermal conductivity of the cardboard is 0.07 Wm-1K-1, the conductivity of potato is 2.5 W m-1 K-1 and the latent heat of crystallization 2.74 x 105 J kg-1). | CO5 | A | 6 |
|  | b. | Explain with sketch the working of water ammonia type vapor absorption refrigeration system. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the construction and working of screw conveyors with sketches. | CO6 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the construction and working of the following sections in a bucket elevator:   1. Head section 2. Boot section 3. Elevator legs 4. Elevator belts | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Describe the working principle of pumps and their applications |
| **CO2** | Categorize the different power transmission systems. |
| **CO3** | Demonstrate the working principle of boilers and estimate the performance. |
| **CO4** | Identify the suitable refrigerants for various mechanical refrigeration systems. |
| **CO5** | Prioritize applications of different food chillers and freezers. |
| **CO6** | Express the working principle of horizontal and vertical material handling systems. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **23FP2049** | **Duration** | **3hrs** |
| **Course Title** | **PROCESSING OF FOOD COMMODITIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Mention the particle size of Maida. | | CO1 | U | 1 |
| 2. | Recall the optimal fermentation temperature for sponge fermentation in sponge and dough process. | | CO2 | U | 1 |
| 3. | Mention the TSS of Jam. | | CO3 | R | 1 |
| 4. | Define standard milk. | | CO4 | R | 1 |
| 5. | List two chemical properties used as quality parameters for wheat quality. | | CO1 | R | 1 |
| 6. | Give two examples for humectants. | | CO2 | A | 1 |
| 7. | Define Encapsulation | | CO6 | R | 1 |
| 8. | Indicate the fat and carbohydrate composition of cocoa bean | | CO6 | U | 1 |
| 9. | State the caffeine content of fresh packed tea shoots of fresh leave. | | CO5 | R | 1 |
| 10. | Identify the inlet and exhaust temperature for fluid bed drier. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe any three tests for the quality of black tea. | | CO5 | R | 3 |
| 12. | Write any six minimum quality standards for black tea. | | CO5 | U | 3 |
| 13. | Summarize the functional properties of ginger. | | CO6 | U | 3 |
| 14. | Write the stages of fermentation in primary processing. | | CO6 | A | 3 |
| 15. | Give five examples of beneficial microorganisms present in milk. | | CO3 | R | 3 |
| 16. | List the types of pasteurization methods. | | CO4 | 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. | Evaluate any two tests for dough and gluten strength in wheat quality with graphs. | CO1 | E | 6 |
|  | b. | Illustrate the various steps involved in the manufacture of bread by straight dough fermentation process. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. |  | Define Canning. Write in detail about the production line of the canning process for fruits and vegetable with flowchart. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Summarize any three milk and milk products manufacturing process. | CO3 | An | 6 |
|  | b. | Explain in detail about any three equipment’s used for milk processing. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Write the manufacturing process of sausage with flow chart. | CO4 | A | 6 |
|  | b. | Discuss in detail about carcass processing of buffalo. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Describe in detail the grades and types of wheat flour. | CO1 | U | 6 |
|  | b | Describe the manufacturing process of jellies with a flowchart. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Write in detail any six common flat form tests for milk. | CO3 | A | 6 |
|  | b. | Explain in detail the role, importance and functions of different forms of eggs, milk, fats and emulsifiers. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the manufacturing process of black tea with a neat diagram. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the methods of processing of Pepper with flowchart. | CO6 | An | 6 |
|  | b. | Describe in detail the manufacturing process of chocolate with flowchart. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Recognize the physicochemical characteristics of various food commodities. |
| **CO2** | Understand the processing technologies involved in food processing industries. |
| **CO3** | Apply their knowledge in the manufacture of novel food products. |
| **CO4** | Categorize the methods of preservation in food production. |
| **CO5** | Choose the best fit processing technique for a specific food commodity. |
| **CO6** | Distinguish the various layouts of food processing based on the ease of operation. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **24FP3001** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCED CHARACTERIZATION TECHNIQUES IN FOOD ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the detailed information of various chromatographic parameters and their significance. | CO1 | U | 8 |
| b. | Illustrate the working principle of various detectors used in Gas chromatography. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. |  | Explain the principle, instrumentation, and application of FTIR in determining the functional groups present in the given sample. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 3. |  | Describe the principle and instrumentation involved in Atomic Emission Spectroscopy and state its application. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 4. | a. | Compare nuclei with various spin quantum numbers and their interaction with external magnetic fields. | CO4 | E | 8 |
| b. | Interpret the role of shielding and deshielding groups on the chemical shift in NMR with suitable examples. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 5. | a. | Explain in detail iso-electro focusing and capillary electrophoresis. | CO5 | R | 8 |
| b. | Describe conductometry and its types, highlighting its scope and limitations. | CO5 | An | 8 |
|  |  |  |  |  |  |
| 6. | a. | Classify chromatographic separations according to the nature of the phases and the mode of operation. | CO1 | U | 8 |
| b. | Explain the different mechanisms employed in chromatography for the separation of mixtures. | CO1 | An | 8 |
|  |  |  |  |  |  |
| 7. |  | Illustrate the principle, instrumentation, and applications of a Mass Spectrometer. | CO4 | A | 16 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Illustrate the principle involved in Differential Scanning Calorimeter to determine the thermal properties of food material. | CO6 | A | 10 |
| b. | Explain the principle and operation of XRD with sketches. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **24FP3003** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCES IN FOOD PACKAGING TECHNOLOGY** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | **Summarize the different types of packaging materials, their characteristics, and their uses.** | CO1 | U | 8 |
|  | b. | Describe how the choice of packaging material is influenced by factors like cost, product type, and environmental concerns. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 2. | a. | Explain the various types of labels used in packaging across different industries. | CO2 | U | 8 |
|  | b. | Summarize the role of labels in providing essential information and ensuring compliance with legal regulations. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Explain the various antimicrobial agents used in packaging materials and their effectiveness in preventing the growth of harmful microorganisms. | CO3 | A | 8 |
|  | b. | Describe the principle of Radio Frequency Identification (RFID) tags and the various benefits of using RFID technology in food packaging. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 4. | a. | Elucidate how Life Cycle Assessment (LCA) is used to evaluate the environmental impact of food and beverage packaging from production to disposal. | CO4 | U | 10 |
|  | b. | Summarize the roles of nanomaterials in edible packaging system. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Explain the impact of non-biodegradable packaging materials on the environment, particularly focusing on pollution and waste accumulation. | CO5 | U | 10 |
|  | b. | Illustrate the role of recycling in the packaging industry and how it contributes to reducing environmental impact. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 6. | a. | Describe the food safety and environmental issues associated with food packaging. | CO6 | A | 12 |
|  | b. | Write short notes on indirect food additives. | CO6 | A | 4 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate how various environmental factors affect the quality and shelf life of packaged products. | CO4 | U | 10 |
|  | b. | Explain the Indian standards and regulations governing plastic containers used in food packaging. | CO6 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Explain how the design of food packaging varies based on the type of food being packaged. | CO5 | A | 10 |
|  | b. | Describe the latest innovations in food packaging and explain how these novel techniques enhance food safety and improve sustainability. | CO3 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL**M** – MARKS ALLOTTED

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

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **24FP3005** | **Duration** | **3hrs** |
| **Course Title** | **FOOD MATERIAL SCIENCE AND ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Describe the phase behavior of a mixed biopolymer solution composed of a protein solution (composition ‘A’) and a polysaccharide solution (composition ‘B’) using a phase diagram. | CO1 | U | 10 |
|  | b. | Compare the physical properties of materials in their crystalline and amorphous states, highlighting differences in structural arrangement, mechanical properties, thermal behavior, and solubility. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 2. |  | Explain with sketches the state and supplemented state diagram for the manufacturing of amorphous milk powders. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 3. | a. | Describe the structural development of bread during the baking process. | CO3 | U | 10 |
|  | b. | Summarize the factors influencing the formation of various polymorphs during the chocolate manufacturing process. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 4. | a. | Explain with sketches the construction and working of Chemical Force Microscopy. | CO4 | A | 10 |
|  | b. | Describe the principle and applications of XRD, highlighting its advantages. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Evaluate the process of spray drying for the manufacture of food powders. | CO5 | E | 10 |
|  | b. | Interpret the reasons to granulate food powders before storage. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 6. | a. | Summarize the functional properties of electrostatic complexes and its applications in food industry. | CO1 | E | 10 |
|  | b. | Explain the development of complex structures during the ice cream manufacturing process. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate with sketches the construction and working of FTIR, highlighting its applications. | CO4 | A | 10 |
|  | b. | Describe the coating principle in continuous fluidized bed techniques. | CO5 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | Explain the role of nanotechnology in utilizing food biopolymers for functional food research. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic concepts of material science and its application in food system, new food product design and development. |
| CO2 | Comprehend the microstructure, size-property relationships, phase transitions, and interfacial phenomena in food in terms of stability and performance. |
| CO3 | Examine the mechanism and kinetics of gelation and their relation to the structure and properties of food materials. |
| CO4 | Interpret the basic principles of food material characterizing techniques on the formation and structure of food biopolymers. |
| CO5 | Characterize food powders using various techniques and their influence on processing and quality of foods. |
| CO6 | Develop nanostructures of foods and nano-encapsulation methods of food ingredients. |