A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code:UA105

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Professional Elective

Agricultural Engineering

21AGV105– FOOD PROCESS EQUIPMENT AND DESIGN

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. For a food processing plant, which factor is most critical during the installation of pressure vessels and pipelines? CO1- U

   (a) Ease of cleaning (b) Compatibility with food materials

   (c) Aesthetic design (d) Installation cost

2. The primary purpose of a pressure vessel in a food processing plant CO1- U

   (a) To store raw food products

   (b) To maintain high temperatures for sterilization

   (c)To withstand internal pressure while maintaining product quality

   (d) To regulate the flow of fluids

3. Which of the following is a common application of evaporators in food processing? CO1- U

   a) Concentrating fruit juice (b) Extracting essential oils

   (c) Drying food products (d) Cooling milk

4. Which of the following factors is most important in the design of a membrane separation system? CO1- U

   (a) Membrane permeability b) Pipe diameter

   (c) Type of fluid used (d) Number of valves

5. Food extrusion is a process used for: CO1- U

(a) Cooking and shaping food products

(b) Preserving food through dehydration

(c) Packaging food in vacuum-sealed bags

d) Cooling food at low temperatures

6. The following is a disadvantage of a fluidized bed dryer CO1- U

(a) Uneven drying (b) High power consumption

(c) Limited scalability (d) Inability to handle small batches

7. The refrigerant used in Cryogenic freezers is _____ CO1- U

(a) Liquid nitrogen (b) Ammonia (c) Carbon dioxide gas (d) Water vapor

8. Unit used to measure cooling load is_____ CO1- U

(a) kW (Kilowatt) (b) British Thermal Units per hour (c) Joules (d) Pascal

9. The type of mixer suitable for dry powders and granules is_____ CO1- U

(a) Ribbon blender (b) Homogenizer (c) Propeller mixer (d) Ultrasonic mixer

10. Principle is used in hammer mill for size reduction CO1- U

(a) Compression (b) Impact (c) Shearing (d) Attrition

PART – B (5 x 2= 10Marks)

11. List out different types of heat processing equipments. CO1- U

12. Give the primary purpose of designing a filtration process in food processing, and which factors must be considered for effective operation? CO1- U

13. Sketch tray dryer and label its parts. CO1- U

14. How does controlled atmospheric storage help in extending the shelf life of perishable goods? CO1- U

15. Compare axial and radial flow agitators. CO1- U

PART – C (5 x 16= 80 Marks)

16. (a) Design a pressure vessel and pipeline for a homogenizer in milk processing unit; make necessary design considerations for designing the system. CO2- App (16)

Or

	(b)	How are engineering principles applied in the design and operation of food processing equipment? Discuss the impact of these principles on the efficiency, safety, and quality of food products.	CO2- App	(16)
17.	(a)	Design a single-effect evaporator used in a food processing plant for concentrating liquid food products. Provide a labeled diagram and discuss its energy efficiency and heat transfer mechanism.	CO2- App	(16)
		Or		
	(b)	Design plate heat exchangers in food processing, considering energy efficiency, space utilization, maintenance, and hygienic requirements.	CO2- App	(16)
18.	(a)	Compare different drying methods (tray drying, spray drying, freeze drying, and fluidized bed drying) based on product quality, efficiency, and cost.	CO3- App	(16)
		Or		
	(b)	Design of a Twin-Screw Extruder for Snack Production and outline the installation and maintenance procedures for smooth operation.	CO3- App	(16)
19.	(a)	How do different packaging materials affect the maintenance of the desired gas composition in Modified Atmosphere Storage (MAS) for perishable products?	CO3- App	(16)
		Or		
	(b)	Develop a step-by-step installation plan for setting up a new freezer unit in a commercial food processing plant.	CO3- App	(16)
20.	(a)	Discuss the design considerations of agitators, their types, and the effect of impeller shape on mixing efficiency.	CO1- U	(16)
		Or		
	(b)	Explain the working principles, types, and applications of different mixing and blending equipment used in the food industry.	CO1- U	(16)