

**SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)**

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF AGRICULTURAL ENGINEERING

QUESTION BANK



VI SEMESTER

PAG103 FOOD PLANT DESIGN AND MANAGEMENT

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Prepared by

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SUBJECT: FOOD PLANT DESIGN AND MANAGEMENT

SEM / YEAR: 06 /III

UNIT-I PLANT LAYOUT-INTRODUCTION

9

Design considerations of processing agricultural and food products – Plant design concepts and general design considerations: Plant layout, plant location, location factors and their interaction with plant location – Location theory models, and computeraided selection of the location – Human factors in design, selection of materials of construction and standard component – Design standards and testing standards.

PART - A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define plant layout.	BT-1	Remembering
2.	List any two objectives of good plant layout.	BT-2	Understanding
3.	What is meant by plant location?	BT-1	Remembering
4.	Mention any two factors influencing plant location.	BT-1	Remembering
5.	What is a location factor rating?	BT-2	Understanding
6.	Define location theory.	BT-1	Remembering
7.	Name any two location theory models.	BT-2	Understanding
8.	What is computer-aided location selection?	BT-2	Understanding
9.	Write the advantages of using software tools for site selection.	BT-1	Remembering
10.	Mention two human factors to be considered in plant design.	BT-1	Remembering
11.	What is ergonomics?	BT-1	Remembering
12.	List any two criteria for selecting materials of construction.	BT-2	Understanding
13.	What are standard components? Give two examples.	BT-2	Understanding
14.	Define design standards.	BT-1	Remembering
15.	Give examples of national design standards used in food processing industry.	BT-1	Remembering
16.	What are testing standards?	BT-1	Remembering
17.	State any two objectives of testing standards.	BT-2	Understanding
18.	Mention design considerations for perishable products.	BT-2	Understanding
19.	What is process flow design?	BT-1	Remembering
20.	Define material handling in plant design.	BT-1	Remembering

21.	Name two types of plant layout.	BT-2	Understanding
22.	What is modular plant design?	BT-1	Remembering
23.	Give two reasons for considering safety in plant design.	BT-2	Understanding
24.	What is the significance of sanitation in plant layout?	BT-1	Remembering
25.	Define HACCP-based design consideration.	BT-2	Understanding

PART – B

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Explain in detail the general design considerations involved in processing agricultural and food products.	BT-3	Applying
2.	Discuss the various types of plant layouts with neat sketches and their applicability in food industries.	BT-4	Analysing
3.	Elaborate on the factors influencing plant location and evaluate their interrelationships.	BT-5	Evaluating
4.	Describe the various plant location theory models and compare their merits and limitations.	BT-3	Applying
5.	Explain the role of computer-aided tools in plant location selection with suitable examples.	BT-4	Analysing
6.	Discuss human factors in plant design and justify their importance in ensuring operational efficiency.	BT-4	Analysing
7.	Explain the criteria for selection of materials of construction for food processing equipment.	BT-4	Analysing
8.	Write in detail about standard components used in food processing plants and their advantages.	BT-3	Applying
9.	Explain the concept of design standards and describe their relevance in food processing industries.	BT-3	Applying
10.	Discuss various testing standards applicable for food processing plant design and equipment.	BT-4	Analysing
11.	What are the important safety and hygiene considerations in the design of food processing plants? Explain.	BT-3	Applying
12.	Describe the steps involved in designing a plant layout for a food processing facility.	BT-3	Applying
13.	Explain the interaction between product characteristics and design considerations in agro-food processing plants.	BT-4	Analysing
14.	Discuss the role of automation and modern technologies in plant design and layout optimization.	BT-4	Analysing
15.	Explain material handling system design in food processing plants with examples.	BT-3	Applying
16.	Compare and contrast different materials of construction used in food processing equipment (stainless steel, plastics, composites, etc.).	BT-4	Analysing
17.	Write in detail about ergonomics and human-machine interaction considerations in agro-food plant design.	BT-4	Analysing

UNIT-II PROCESS ECONOMICS OF PLANT LAYOUT**9**

Feasibility analysis and preparation of feasibility report – Plant size, factors affecting plant size and their interactions, estimation of break -even and economic plant size; Product and process design – Process selection, process flow charts – Plant utilities, electricity, water, steam, air, raw material requirements – Computer aided development of flow charts.

PART - A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	What is feasibility analysis?	BT-2	Understanding
2.	State any two objectives of preparing a feasibility report.	BT-1	Remembering
3.	Define plant size.	BT-1	Remembering
4.	Mention two factors that affect plant size.	BT-2	Understanding
5.	What is economic plant size?	BT-1	Remembering
6.	Define break-even point.	BT-1	Remembering
7.	State the formula for calculating break-even quantity.	BT-2	Understanding
8.	What is process design?	BT-2	Understanding
9.	Mention two criteria for process selection.	BT-1	Remembering
10.	What is a process flow chart?	BT-1	Remembering
11.	List any two advantages of using flow charts in process design.	BT-2	Understanding
12.	What are plant utilities?	BT-2	Understanding
13.	Mention two sources of water used in food processing plants.	BT-1	Remembering
14.	Why is steam required in food processing operations?	BT-2	Understanding
15.	State two uses of compressed air in a processing plant.	BT-1	Remembering
16.	What is meant by raw material requirement estimation?	BT-1	Remembering
17.	Define utility load calculation.	BT-2	Understanding
18.	Mention two computer tools used for developing process flow charts.	BT-1	Remembering
19.	What is meant by preliminary feasibility study?	BT-2	Understanding
20.	Give two reasons for conducting market analysis during feasibility study.	BT-4	Analysing
21.	What is sensitivity analysis?	BT-1	Remembering
22.	Define capacity utilization.	BT-1	Remembering
23.	Mention two limitations of break-even analysis.	BT-1	Remembering
24.	What is material balance?	BT-2	Understanding
25.	Define utility optimization.	BT-1	Remembering

PART – B

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Explain the major steps involved in feasibility analysis and preparation of a feasibility report for a food processing plant.	BT-3	Applying
2.	Discuss in detail the concept of plant size, factors affecting plant size, and how these factors interact.	BT-4	Analysing
3.	Explain break-even analysis with suitable diagrams and illustrate its application in determining economic plant size.	BT-4	Analysing
4.	Describe the steps involved in product and process design for a new food product.	BT-4	Analysing
5.	Discuss the criteria for process selection and illustrate how process alternatives are evaluated.	BT-3	Applying
6.	Explain the preparation of process flow charts and discuss their importance in process design.	BT-4	Analysing
7.	Describe the different types of plant utilities and explain how utility requirements are estimated.	BT-4	Analysing
8.	Explain in detail the role of electricity, water, and steam in food processing operations.	BT-4	Analysing
9.	Describe the significance of air and compressed air systems in food processing plants.	BT-4	Analysing
10.	Discuss raw material requirement estimation and its significance in plant design.	BT-3	Applying
11.	Explain how computer-aided tools are used for developing process flowcharts, layout, and utility diagrams.	BT-4	Analysing
12.	Analyze the relationship between plant size, cost structure, and profitability with examples.	BT-4	Analysing
13.	Discuss the importance of feasibility reports in project planning and decision-making.	BT-3	Applying
14.	Explain process design approaches for batch and continuous food processing systems.	BT-4	Analysing
15.	Describe the methodology for utility planning and optimization in a food processing industry.	BT-3	Applying
16.	Discuss the integration of process flow charts with material balance and energy balance in plant design.	BT-4	Analysing
17.	Write detailed notes on economic analysis of plant size, including cost-volume-profit relationships.	BT-3	Applying

UNIT-III DEVELOPMENT AND PRESENTATION OF LAYOUT

9

Hygienic design aspects and worker's safety –functional design of plant building and selection of building materials – estimation of capital investment, analysis of plant costs and profitability's – management techniques in plant design including applications of network analysis – preparation of project report and its appraisal.

PART - A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	What is hygienic design in food processing plants?	BT-2	Understanding
2.	Mention any two principles of hygienic plant design.	BT-1	Remembering
3.	Define worker safety.	BT-2	Understanding
4.	Name two safety measures used in food processing plants.	BT-1	Remembering
5.	What is functional design of a plant building?	BT-1	Remembering
6.	Mention two factors influencing the selection of building materials.	BT-1	Remembering
7.	What are the requirements of food-grade building materials?	BT-2	Understanding
8.	Define capital investment.	BT-2	Understanding
10.	List two components of fixed capital investment.	BT-1	Remembering
11.	What is working capital?	BT-2	Understanding
12.	Define depreciation.	BT-2	Understanding
13.	What is meant by plant cost analysis?	BT-2	Understanding
14.	State two indicators of profitability.	BT-2	Understanding
15.	What is a project report?	BT-1	Remembering
16.	Mention the essential components of a project report.	BT-2	Understanding
17.	Define management techniques.	BT-1	Remembering
18.	What is network analysis?	BT-2	Understanding
19.	Expand CPM and PERT.	BT-1	Remembering
20.	Mention two applications of CPM in plant design.	BT-1	Remembering
21.	What is slack time in network analysis?	BT-2	Understanding
22.	What is project appraisal?	BT-1	Remembering
23.	Give two financial appraisal methods.	BT-2	Understanding
24.	Mention two physical hazards related to worker safety.	BT-2	Understanding
25.	What is the purpose of ventilation in plant building design?	BT-2	Understanding

PART - B

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Explain in detail the hygienic design aspects of food processing plants and their importance in food safety.	BT-3	Applying
2.	Discuss worker safety measures, hazard control methods, and safety management practices in a food processing plant.	BT-4	Analysing
3.	Describe the functional design of plant buildings and the requirements for an efficient food processing facility.	BT-4	Analysing
4.	Explain the criteria for selecting building materials for food industry structures and equipment.	BT-3	Applying
5.	Discuss the various components of capital investment and methods of estimating capital requirements for a new plant.	BT-3	Applying
6.	Explain the analysis of plant costs, cost components, and methods used to evaluate profitability.	BT-4	Analysing
7.	Describe the different profitability indicators (NPV, IRR, ROI, payback) and their application in project evaluation.	BT-3	Applying

8.	Write in detail about the role of management techniques in plant design and planning.	BT-4	Analysing
9.	Discuss the principles, features, and applications of network analysis techniques in plant design.	BT-4	Analysing
10.	Compare CPM and PERT and explain their use in scheduling and project decision-making.	BT-4	Analysing
11.	Explain the steps involved in preparation of a detailed project report for a food processing unit.	BT-4	Analysing
12.	Describe various project appraisal methods and explain their significance in investment decisions.	BT-4	Analysing
13.	Discuss the interaction between hygienic design, worker safety, and functional building design.	BT-3	Applying
14.	Explain the importance of cost estimation and financial planning in ensuring the success of a food processing plant.	BT-3	Applying
15.	Discuss layout planning and its relationship with building design and capital investment.	BT-4	Analysing
16.	Explain maintenance, sanitation, and waste management considerations in hygienic plant building design.	BT-3	Applying
17.	Elaborate on the integration of network analysis and project management techniques for successful plant implementation.	BT-4	Analysing

UNIT-IV FOOD PROCESSING PLANT & EQUIPMENT LAYOUT 9

Plant layout and design of bakery and biscuit industries – fruits and vegetables processing industries including beverages – milk and milk products – meat, poultry and fish processing industries – Equipment layout in Food Industries: Basic understanding of equipment layout and. Preparation of flow sheets for material movement and utility consumption in food plants.

PART – A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	What is plant layout?	BT-1	Remembering
2.	Mention two objectives of an efficient plant layout in food industries.	BT-1	Remembering
3.	List out major sections in a bakery plant layout.	BT-2	Understanding
4.	What is the purpose of proofing in bakery production?	BT-2	Understanding
5.	Mention the unit operations involved in biscuit manufacturing.	BT-2	Understanding
6.	State the important considerations in layout design for fruit processing plants.	BT-1	Remembering
7.	What is blanching in fruit and vegetable processing?	BT-2	Understanding
8.	Name two types of beverages produced in food industries.	BT-2	Understanding
9.	List out the critical areas in the layout of milk processing plants.	BT-2	Understanding
10.	What is pasteurization?	BT-2	Understanding
11.	Mention two milk products requiring specialized plant layout.	BT-2	Understanding

12.	State two important requirements in meat processing plant layout.	BT-1	Remembering
13.	What does HACCP stand for?	BT-1	Remembering
14.	Mention any two hygienic design requirements in poultry processing.	BT-2	Understanding
15.	State two common operations in fish processing plants.	BT-1	Remembering
16.	What is equipment layout?	BT-1	Remembering
17.	Mention any two objectives of equipment layout design.	BT-1	Remembering
18.	Define material movement in food plants.	BT-2	Understanding
19.	What is a process flow sheet?	BT-2	Understanding
20.	Mention the benefits of using a flow sheet in plant design.	BT-2	Understanding
21.	What is the role of utility planning in food plant layout?	BT-1	Remembering
22.	Give examples of any food processing industries in India.	BT-2	Understanding
23.	What is CIP (Clean-in-Place)?	BT-2	Understanding
24.	Mention two factors affecting equipment placement.	BT-1	Remembering
25.	Define cold storage in the context of food processing plants.	BT-1	Remembering

PART B

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Explain the principles and steps involved in designing the plant layout for a bakery industry.	BT-3	Applying
2.	Discuss the layout and design considerations for biscuit manufacturing, including processing operations and equipment arrangement.	BT-4	Analysing
3.	Describe the plant layout for fruits and vegetables processing industries, highlighting the sections for receiving, washing, sorting, and packaging.	BT-3	Applying
4.	Explain the design and layout of a beverage processing plant, including utilities and sanitation requirements.	BT-3	Applying
5.	Discuss in detail the layout design of milk processing plants, including raw milk reception, pasteurization, homogenization, and packaging.	BT-4	Analysing
6.	Explain the layout considerations for manufacturing milk products such as butter, cheese, and yogurt.	BT-4	Analysing
7.	Describe the general plant layout and operational flow in meat processing industries.	BT-3	Applying
8.	Explain the layout requirements for poultry processing plants with emphasis on hygiene and waste management.	BT-4	Analysing
9.	Discuss the design and layout of fish processing plants, including cold chain handling and preservation.	BT-4	Analysing
10.	Explain the importance of equipment layout in food industries and discuss the factors influencing equipment placement.	BT-3	Applying
11.	Describe how to prepare a process flow sheet for material movement in a bakery or milk processing plant.	BT-4	Analysing
12.	Explain the preparation of flow sheets for utility consumption (water, steam, electricity, air) in food	BT-3	Applying

	industries.		
13.	Discuss the role of automation and modern technologies in optimizing plant layout in food industries.	BT-5	Evaluating
14.	Explain the interrelationship between equipment layout, material handling, and process efficiency in food plants.	BT-3	Applying
15.	Discuss sanitary and safety design considerations to be incorporated in food plant layouts.	BT-4	Analysing
16.	Describe with suitable flow diagrams the layout of an integrated food processing facility handling multiple products.	BT-3	Applying
17.	Compare the plant layouts of bakery, milk processing, and meat processing plants, highlighting key similarities and differences.	BT-4	Analysing

UNIT-V PROJECT EVALUATION AND COST ESTIMATION 9

Preparation of flow sheets for material movement and utility consumption in food plants – Application of Program Evaluation and Review Technique (PERT) – Critical Path Method (CPM) in project planning and monitoring – Cost estimation for a Food Plant; Scale-up – Case Study: Preparation of plant layout and cost estimation for a food processing plant

PART – A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	What is a flow sheet in food plant design?	BT-1	Remembering
2.	Mention the components shown in a material movement flow sheet.	BT-2	Understanding
3.	What is utility consumption in food plants?	BT-2	Understanding
4.	List the major utilities needed in food processing industries.	BT-2	Understanding
5.	Define PERT.	BT-2	Understanding
6.	What is the main objective of using PERT in project planning?	BT-2	Understanding
7.	Define CPM.	BT-2	Understanding
8.	Mention any two differences between PERT and CPM.	BT-2	Understanding
9.	What is a critical path?	BT-1	Remembering
10.	What is the significance of slack time?	BT-1	Remembering
11.	Define cost estimation.	BT-2	Understanding
12.	Mention two types of costs involved in food plant cost estimation.	BT-1	Remembering
13.	What is capital cost?	BT-2	Understanding
14.	Define operating cost.	BT-1	Remembering
15.	What is scale-up?	BT-2	Understanding
16.	Mention the challenges faced during scale-up of food processes.	BT-1	Remembering
17.	What is the purpose of equipment layout?	BT-1	Remembering
18.	List out the inputs required for preparing a plant layout.	BT-1	Remembering
19.	What is a Gantt chart?	BT-2	Understanding

20.	Define network diagram.	BT-1	Remembering
21.	What is meant by direct cost?	BT-2	Understanding
22.	What are the factors influencing utility consumption in food plants.	BT-2	Understanding
23.	What is break-even cost estimation?	BT-2	Understanding
24.	State any two benefits of flow sheet preparation.	BT-1	Remembering
25.	What is a case study in plant design context?	BT-1	Remembering

PART-B

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Explain the steps involved in preparing a detailed flow sheet for material movement in a food processing plant.	BT-3	Applying
2.	Discuss the procedure for estimating utility consumption (water, steam, electricity, air) in a food plant with examples.	BT-4	Analysing
3.	Describe the Application of PERT in project planning and scheduling, with a suitable network diagram.	BT-4	Analysing
4.	Explain the principles of CPM and describe its use in identifying project bottlenecks.	BT-4	Analysing
5.	Compare PERT and CPM in detail and explain their relevance in food plant project management.	BT-4	Analysing
6.	Explain the preparation of network diagrams and discuss how project duration is calculated using PERT/CPM.	BT-4	Analysing
7.	Discuss various cost estimation methods used for food plants and explain the components of capital and operating costs.	BT-3	Applying
8.	Explain in detail the importance and methodology of cost estimation for setting up a food processing plant.	BT-3	Applying
9.	Define scale-up. Discuss the factors affecting scale-up in food processing and challenges in moving from pilot to industrial scale.	BT-4	Analysing
10.	Explain the process of scaling up a food product from laboratory development to commercial production.	BT-3	Applying
11.	Discuss the steps involved in preparing a full plant layout for a food plant, including zoning, workflow, and utilities.	BT-3	Applying
12.	Explain how material movement and utility flow sheets assist in designing an efficient food processing facility.	BT-3	Applying
13.	Discuss the role of PERT and CPM in project monitoring, control, and decision-making for food industries.	BT-4	Analysing
14.	Describe the detailed procedure for performing cost estimation and economic evaluation of a food plant.	BT-3	Applying
15.	Explain how utility consumption analysis can be integrated with plant layout and cost estimation.	BT-4	Analysing
16.	Prepare a plant layout and utility flow sheet for any one food processing plant (bakery, dairy, fruit processing, beverage plant, etc.) and estimate the capital and operating cost.	BT-4	Analysing
17.	Develop a PERT/CPM network for the construction of a small food processing facility and identify the critical path, project duration, and cost implications.	BT-3	Applying

