Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150506 Date:09-12-2024

Subject Name:Chemical Process Plant Design & Economics

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	What is the role of chemical engineer in a chemical process industry?	**03**
	(b)	Distinguish between standard v/s special equipment.	**04**
	(c)	Explain in detail about chemical plant design.	**07**
Q.2	**(a)**	A heat Exchanger of Area 10 m^2 costed Rs.50,000 in 2019. What is the estimated cost of 15 m^2 heat exchanger in 2024? Assume that cost index in 2019 was 270 and in 2024 is 320. Equipment cost vs. capacity factor is 0.6.	**03**
	(b)	Write a brief note on 'Unit area concept'.	**04**
	(c)	Draw a tree-diagram to show the cash flow for an industrial operation.	**07**
		OR	
	(c)	The total investment for a chemical plant is ₹ 50 million and the working capital is ₹ 5 million. If the plant can produce an average of 8000 kg of final product per day during a 365 day year, what selling price in ₹ per kg of product would be necessary to give a turnover ratio of 1.0?	**07**
Q.3	**(a)**	Sketch an ideal plant layout.	**03**
	(b)	Explain about (i) physical depreciation and (ii) functional depreciation.	**04**
	(c)	State and discuss the factors to be considered in selection of the location of a chemical plant.	**07**
		OR	
Q.3	**(a)**	Define: (1) Salvage value (2) Book value (3) Market Value	**03**
	(b)	List methods for determining depreciation. Explain any one in detail.	**04**
	(c)	List all points in feasibility survey. Explain 'Markets' & 'Properties of products' with respect to the same	**07**
Q.4	**(a)**	Explain break-even chart. A D Fine Chemicals Ltd. sells a chemical for Rs.120 per kg and it cost Rs. 80 per kg to produce it, and has annual fixed cost of Rs. 12,00,000. How much kg of product will the company need to sell to break-even?	**03**
	(b)	Discuss planning of project schedule by 'BAR CHART' in detail.	**04**
	(c)	What is Pilot Plant? State the objectives and importance of pilot plant.	**07**
		OR	
Q.4	**(a)**	Using diagram explain break – even point and discuss importance of break-even analysis.	**03**
	(b)	State various factors affecting investment and total product cost?	**04**

	(c)	Write short note on CPM and PERT.	**07**
Q.5	**(a)**	Discuss replacement studies with example.	**03**
	(b)	Explain following cost index: (i) Marshall and Swift Equipment Cost Index (ii) Chemical Engineering Plant Cost Index	**04**
	(c)	The fixed cost of steam line for circular pipe is express as: (35x+65) Rs./hr. Cost of loss of heat from pipe is given as: (225/x) Rs./hr. Where x is thickness of insulation, in Cm. Determine the optimum value of thickness and also calculate the total cost of pipe per meter for optimum thickness.	**07**

OR

Q.5	**(a)**	Draw a specification sheet for Heat Exchanger.	**03**
	(b)	Write briefly on overhead v/s underground piping.	**04**
	(c)	The original value of a heat exchanger is Rs, 6.00 lacs. At the end of useful life of 10 years its salvage value is estimated to be Rs. 60,000. Determine the asset value of the heat exchanger at the end of 5 years using: i) Straight line method ii) Text book Declining Balance Method	**07**

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