Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150506 Date:15-12-2023

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)**	Write in brief on different types of flow diagrams used for designing the plant.	**03**
	(b)	Distinguish between standard vis a vis special equipment.	**04**
	(c)	Justify the various factors to be considered in location of dye and dye intermediate manufacturing industry in Gujarat on sound physico-chemical principles?	**07**
Q.2	**(a)**	Write in brief on continuous process v/s batch process	**03**
	(b)	Write briefly on overhead v/s underground piping	**04**
	(c)	Write in brief the importance of utilities in chemical industries.	**07**
		OR	
	(c)	Discuss principle of Piping Design	**07**
Q.3	**(a)**	Discuss selection criteria of material handling equipment.	**03**
	(b)	Explain electrical hazards and health hazards in chemical process plant.	**04**
	(c)	Enlist the factors to be considered on total product cost estimation	**07**
		OR	
Q.3	**(a)**	List out six important requirements for piping layout.	**03**
	(b)	Discuss any three safety aspects to be considered in a chemical plant project	**04**
	(c)	Discuss the selection criteria of valves. Name commonly used pipe fittings and valves with their main functions.	**07**
Q.4	**(a)**	Define/explain the following terms in context with plant design & economics, citing examples or mathematical correlation and/or additional illustration wherever possible: (i) Payout period (ii) Cost index (iii) ROI	**03**
	(b)	Explain fixed and working capital investment	**04**
	(c)	Write a short note on tree flow diagram showing cash flow for individual operation.	**07**

OR

Q.4 **(a)** Discuss six-tenth factor rule **03**

(b) Discuss with figure, cumulative cash position for an industrial operation neglecting time value of money **04**

(c) The original value of cyclone separator if ₹ 52,000/- and its salvage value is ₹ 2000/-. The service life is estimated to be 10 years. How much amount must be placed annually in an annuity at an **07**

1. Interest rate of 6% to obtain sufficient funds to replace the cyclone separator at the end of 10 years?
2. Interest rate of 10% to obtain sufficient funds to replace the cyclone separator at the end of 10 years?

Comment on your answer.

Q.5 **(a)** Define depreciation. List six methods for determining depreciation**.** **03**

(b) Write a brief note on PERT and CPM techniques used for Inventory control **04**

(c) Draw Bar Chart for the following activities carried out to complete a project in a typical industry. **07**

Activity	A	B	C	D	E	F	G	H	I	K
Duration (weeks)	3	4	4	2	3	3	4	4	5	6
Following Activity	B,D,E	C	C	F	G	H	I	---	K	---

What is the project completion time?

OR

Q.5 **(a)** Explain break-even point with a diagram. **03**

(b) Discuss various practical factors of alternative investment and replacement decision. **04**

(c) Following activities are part of a front end engineering design project to be scheduled using CPM **07**

Activity	Predecessor	Time (Weeks)
A	---	---
B	A	3
C	A	7
D	C	2
E	B.D	4
F	D	3
G	E.F	7

Draw the network and critical path by finding the slack time of each activity. What is the project completion time?

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