Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: 170503 **Date: 04-12-2014**

Subject Name: Plant Design and Project Engineering

Time: 10:30 am - 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.**

Q.1	**(a)**	State and discuss the factors to be considered in selection of the location of a chemical process plant with special reference to soda-ash plant in Gujarat.	**07**
	(b)	Enlist various methods for estimating capital investment and discuss any one method.	**07**
Q.2	**(a)**	Discuss the method for evaluation of total product cost showing the individual components.	**07**
	(b)	State the advantages of standard equipment over special equipment. What are the different types of flow diagrams?	**05+02**
		OR	
	(b)	Illustrate briefly the principle of piping layout. State various pipe fittings and pipe supports, mentioning their special functions, if any.	**07**
Q.3	**(a)**	Explain 'sixth-tenth factor rule' and 'cost indices'. A heat exchanger of area 10 m^2 costed Rs 50,000 in 2009. What is the estimated cost of a 15 m^2 heat exchanger in 2014? Assume that the cost index in 2009 was 270 and in 2014 it is 320. Equipment cost-vs-capacity exponent is 0.6.	**04+03**
	(b)	State and explain the factors affecting investment and production cost.	**07**
		OR	
Q.3	**(a)**	A proposed manufacturing plant requires an initial fixed capital investment of $ 900,000 and $ 100,000 of working capital. It is estimated that the annual income will be $ 800,000 and the annual expenses including depreciation will be $ 520,000 before income taxes. A minimum annual return of 15% before income tax is required before the investment would be worthwhile. Income taxes amount to 34 percent of all pre-tax profits. Determine the annual percent return on total investment before and after income taxes.	**07**
	(b)	What is the difference between depreciation and amortization? State and briefly explain various methods of determining depreciation	**02+05**
Q.4	**(a)**	Define/Explain the following terms in context with plant design and project engineering (Any seven): (i) capitalized cost (ii) compound interest (iii) payback period (iv) contingency (v) break even point (vi) equity (vii) battery limit (viii) critical path (ix) salvage value	**07**
	(b)	State various methods of profitability evaluation and explain the principle of each method in brief.	**07**
		OR	
Q.4	**(a)**	The original value of a piece of equipment is $22,000, completely installed and ready for use. Its salvage value is estimated to be $2000 at the end of a service life estimated to be 10 years. Determine the asset (or book) value of the equipment at the end of 5 years using straight line and textbook declining balance method.	**07**
	(b)	Discuss the practical factors in alternative investment and replacement studies.	**07**

Q.5 **(a)** State and explain various factors for techno-economic feasibility survey of a Chemical process plant. **07**

(b) Define pilot plant. What are the importances of laboratory development of pilot plant? **02+05**

OR

Q.5 **(a)** Write a note on PERT and CPM, mentioning their role in scheduling of projects. **07**

(b) A project as been defined to contain the following list of activities, along with their required times for completion: **07**

Activity	Time (days)	Immediate predecessor
A	1	--
B	4	A
C	3	A
D	7	A
E	6	B
F	2	C,D
G	7	E,F
F	9	D
I	4	G,H

Draw the network diagram, show early start and early finish time for each activity, and determine the critical path.

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