

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2020****Subject Code:2170503****Date:25/01/2021****Subject Name:Plant Design & Project Engineering****Time:10:30 AM TO 12:30 PM****Total Marks: 56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Understand the questions carefully and write in proportion to marks it carries

- Q.1** (a) It is desired to borrow \$ 1000 to meet a financial obligation. This money can be borrowed from a loan agency at a monthly interest rate of 2 %. Determine the total amount of principal plus compounded interest due after 2 years if no intermediate payments are made. **03**
- (b) Define/explain the following terms citing examples or mathematical correlation and/or additional illustration wherever possible: (Any four) **04**
(i) Capitalized cost (ii) Battery limit (iii) Sixth tenth factor rule (iv) Turnover ratio (v) Payback period
- (c) Critically analyze the location of following chemical plants in terms of raw material availability, site characteristic, waste disposal and transportation. **07**
i) Reliance refinery, Jamnagar, Gujarat
ii) Tata Chemicals, Mithapur, Gujarat
- Q.2** (a) Define cost index with suitable examples. Explain how will you use index method for estimating equipment cost? **03**
- (b) Explain the importance of laboratory development of any 'Pilot plant'. Would you recommend dismantling the pilot plant once full-scale production starts? State with reason. **04**
- (c) Define plant layout. State the basic types of flow patterns employed in designing of plant layout with neat diagram. **07**
- Q.3** (a) Enlist the desirable characteristics of an ideal plant lay out **03**
- (b) Draw a tree-diagram to show the cash flow for an industrial operation. **04**
- (c) Discuss the selection criteria of valves. State commonly used pipe fittings (with sketches) with their main functions. **07**
- Q.4** (a) State three reasons why 'annual basis' is preferred to 'daily' or 'unit -of-product' bases for total product cost estimation. **03**
- (b) State and explain the factors affecting investment and production cost. **04**
- (c) Discuss the method for evaluation of total product cost showing the individual components. **07**
- Q.5** (a) What are the different milestones of project implementation? Define grass-root plant. **03**
- (b) What are the advantages of using standard equipment over special equipment? **04**
- (c) 'Although a greater investment might be better on a theoretical basis, the additional return would not be worth the extra risks involved when capital must be borrowed or obtained from some other outside source'- Explain by citing the practical factors in alternative investment and replacement studies. **07**
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- Q.6.** (a) State various methods of profitability analysis. Explain any one in brief. **03**
(b) Provide the correct terminology to the following statements. **04**
i) The ratio of immediately available cash to total current liabilities.
ii) The ratio of gross annual sales to the fixed-capital investment
iii) Total amount of product cost equals the total annual sales.
iv) The difference between the original cost of a property and all the depreciation charges made to date.
- (c) A proposed chemical plant will require a fixed capital investment of \$10 million. It is estimated that the working capital will amount to 25% of the total investment, and annual depreciation costs are estimated to be 10 percent of the fixed-capital investment. If the annual profit will be \$3 million, determine the standard return on the total investment and the minimum payout period. **07**
- Q.7** (a) Prepare a rough specification sheet for a tray column distillation unit for BTX separation. **03**
(b) What are the reasons for depreciation? Show with a labeled graph how the asset value of a property varies with time using the straight line, multiple straight lines, SYD and declining balance method. **04**
(c) An investigation of proposed investment has been made. The following results has been presented to management. The minimum payout period based on capital recovery using a minimum return of 10% as a fictitious expense is 10 years, annual depreciation cost amounts to 8% of the total investment. Using this information determine the standard rate of return on the investment. **07**
- Q.8** (a) Solid aerosol, liquid aerosol and contaminant vapors are three of the alarming exposure. State three specific operations whereby these could be produced. What are the measures you would like to recommend to mitigate their exposures? **03**
(b) What are composite, classified and vintage group account? **04**
(c) An R & D Project has certain activities to execute. First three of these activities include design (21), building prototype (5) and evaluating equipment (7). The first activity does not have any predecessor, but it is the predecessor of 2nd and 3rd activity. 4th activity is testing of prototype (2), in which building of prototype is the predecessor. Writing equipment report (5), method report (8), and final report (2) are considered as 5th, 6th and 7th activities. 3rd and 4th activities are the predecessor of 5th and 6th activities respectively. Both 5th and 6th activities are the predecessors of 7th activity. Construct the network diagram and indicate the critical path. The numbers in the brackets indicate the time (in weeks) required for that particular activity. **07**
