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B TECH
(SEM-VIII) THEORY EXAMINATION 2018-19
PLANT DESIGN AND PROJECT ENGINEERING

Time: 3 Hours   *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.
     2. Any special paper specific instruction.

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**

   a. What is cost index?
   b. Explain six tenths factor rule.
   c. What is a preliminary or quick estimate design?
   d. What are the different types of flow diagrams?
   e. What do you mean by pay-out period?
   f. What do you mean by plant layout?
   g. What are factors considered while choosing material of construction for equipment?
   h. Compute the effective rate of return if money at 11% per year is compounded quarterly.
   i. Define safety and fire protective measures in plant design.
   j. What do you mean by grass root plant?

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**

   a. A bond has a maturity value of $1000 and is paying discrete compound interest at an effective annual rate of 3percent.Determine the following at a time four years before the bond reaches maturity value:
      (i) Present worth
      (ii) Discount
      (iii) Discrete compound rate of effective interest which will be received by a purchaser if the bond were obtained for $700.
   b. Discuss objective and contents of techno-economic feasibility survey.
   c. Discuss advantages of standard equipment over special equipment.
   d. The total capital investment for a chemical plant is $1 million, and the working capital is $100,000.If the plant can produce an average of 8000kg of final product per day during a 365-day year,what selling price in dollars per kilogram of product would be necessary to give a turnover ratio of 1.0?
   e. What do you mean by pilot plant? What is importance of pilot plant in process development?

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SECTION C

3.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. Sketch plant layout of any (Chemical) industry that you have visited. As a chemical engineer, justify the same.

   b. Write in brief on PERT and CPM techniques used for inventory control

4.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. Discuss the types of cost indices available in the Chemical Engineering literature. Also discuss the importance of these cost indices for cost estimation of chemical engineering equipment.

   b. Describe the general procedure for optimizing two independent variables both analytically and graphically

5.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. The geographical location of the final plant can have strong influence on the success of the industrial venture. Explain how the geographical and non-geographical factors affect the site selection of a chemical plant. Mention the conventional locational analysis meth.

   b. Differentiate clearly between PFD, PBD and P&ID regarding their contents. Also write about specific purpose(s) of these diagrams

6. **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. What are logical steps in design activities of any process plant? What are important points must be taken into consideration in process developments?

   b. A proposed chemical plant will require a fixed-capital investment of $10 million. It is estimated that the working capital will amount to 25 percent 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 percent return on the total investment and the minimum payout period.

7. **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. Explain the general procedure for determining optimum conditions, both analytical and graphical procedures, with one variable and with two or more variables.

   b. A heat exchanger has been designed for use in a chemical process. A standard type of heat exchanger with a negligible scrap value costs $4000 and will have a useful life of 6 years. Another proposed heat exchanger of equivalent design capacity costs $6800 but will have a useful life of 10 years and a scrap value of $800. Assuming an effective compound interest rate of 8 percent per year, determine which heat exchanger is cheaper by comparing the capitalized costs.

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