Code No: M0822/R07

Set No. 1

IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011
CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS
(Chemical Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain fire and explosion hazards.

   (b) Discuss preservation and control of Mechanical, Electrical and Chemical hazards.   [8+8]

2. Explain the factors affecting Investment and production costs.   [16]

3. The total capital investment for a chemical plant is Rs. One million and the working capital is Rs. 1, 00,000/-. If the plant can produce an average if 8000 kgs of final product per day during a 365 days year, what selling price in Rs. Per kilogram of product would be necessary to give a turn over ratio of 1.0?   [16]

4. A new piece of completely installed equipment costs Rs.15,00,000 and will have a scrap value of Rs. 5,00,000 at the end of its useful life. If the useful-life period is 10 years and the interest is compounded at 6 percent per year, what is the capitalized cost of the equipment?   [16]

5. (a) How are the major insurance requirements for manufacturing concerns classified?

   (b) Discuss in detail about the legal responsibilities of a concern with regard to accident and emergencies.   [8+8]

6. (a) Define salvage value and scrap value.

   (b) A piece of equipment originally costing Rs. 40,000 was put into use 12 years ago. At the time the equipment was put into use, the service life was estimated to be 20 years and the salvage and scrap value at the end of the service life were assumed to be zero. On this basis, a straight line depreciation fund was set up. The equipment can now be sold for Rs. 10,000, and a more advanced model can be installed for Rs.55,000. Assuming the depreciation fund is available for use, how much new capital must be supplied to make the purchase?   [4+12]

7. Discuss about the following:

   (a) Capitalized cost

   (b) Payout period

   (c) Rate of return

   (d) Net present worth.   [4+4+4+4]

8. Explain the general procedure for determining optimum conditions, both analytical and graphical procedures, with one variable and with two or more variables. [16]

Set No. 1

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Code No: M0822/R07

Set No. 2

IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011
CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS
(Chemical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Discuss the detailed engineering design of commercial plant. [16]

2. The purchased and installation costs of some pieces of equipment are given as a function of weight rather than capacity. An example of this is the installed costs of large tanks. The 1990 cost for an installed aluminium tank weighing 100,000 lb was 2 Crores. For a size range from 200,000 to 1,000,000 lb, the installed cost-weight exponent for aluminium tanks is 0.93. If an aluminium tank weighing 700,000 lb is required, what is the present capital investment needed? [16]

3. Draw the economic production chart for a plant operating at 100% capacity with usual nomenclature and explain it. Explain about economic pipe diameter. [16]

4. A Reactor costs Rs. 50,000 with a life of 5 years and having no salvage value requires Rs. 3,000 per year for maintenance and operation. Money in worth 8%:

   (a) What is the present worth of the service rendered?

   (b) What is the future worth of 5 years service rendered?

   (c) What is the capitalized cost for this service assuming perpetual operation?

   [5+5+6]

5. (a) Taxes may be classified into three types. What are they? Explain them.

   (b) Differentiate between surtax, capital gains tax and excess profits tax. [10+6]

6. (a) A reactor of special design is the major item of equipment in a small chemical plant. The initial cost of the completely installed reactor is Rs. 60,000, and the salvage value at the end of the useful life is estimated to be Rs. 10,000. Excluding depreciation costs for the total annual expenses for the plant are Rs. 100,000. How many years of useful life should be estimated for the reactor if 12 percent of the total annual expenses for the plant are due to the cost for reactor depreciation? The straight line method for determining depreciation should be used.

   (b) Explain the straight line method for determining depreciation. [10+6]

7. A proposed manufacturing plant requires an initial fixed capital investment of Rs.900,000 and Rs.100,000 of working capital It is estimated that the annual income will be Rs.800,000 and the annual expenses including depreciation will be Rs.520,000 before income taxes. A minimum annual return of 15% before income taxes is required before the investment will be worthwhile. Income taxes amount to 34% of all pre-tax profits. Determine the following:

Set No. 2

(a) The annual percent return on the total initial investment before income taxes.

(b) The annual percent return on the total initial investment after income taxes.

(c) The annual percent return on the total initial investment before income taxes based on capital recovery with minimum profit.

(d) The annual percent return on the average investment before income taxes assuming straight-line depreciation and zero salvage value. [16]

8. (a) What is optimum economic design? Illustrate the principles of an optimum economic design by means of an example.

(b) Describe the general procedure for optimizing two independent variables both analytically and graphically. [8+8]

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$\boxed{\textbf{Set No. 3}}$

IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011
CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS
(Chemical Engineering)

Time: 3 hours   **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. What is HAZOP? Explain it by giving a case study in any process industry of your choice. [16]

2. Discuss cash flow for industrial operations. [16]

3. Explain the following:

   (a) Patents and royalties
   (b) Copy rights
   (c) Insurance
   (d) Local taxes. [4+4+4+4]

4. (a) Discuss the effect of income-tax rates on the cost of capital.
   (b) What are the sources of capital and explain?
   (c) Write about the following:
       i. Present Worth
       ii. Discrete annual compound interest. [5+5+6]

5. Give a detailed account of Federal income taxes. [16]

6. (a) Define salvage value and scrap value.
   (b) A piece of equipment originally costing Rs. 40,000 was put into use 12 years ago. At the time the equipment was put into use, the service life was estimated to be 20 years and the salvage and scrap value at the end of the service life were assumed to be zero. On this basis, a straight line depreciation fund was set up. The equipment can now be sold for Rs. 10,000, and a more advanced model can be installed for Rs.55,000. Assuming the depreciation fund is available for use, how much new capital must be supplied to make the purchase? [4+12]

7. A company must purchase one reactor to be used in an overall operation. Four reactors have been designed, all of which are equally capable of giving the requires service. The following data apply to the four designs:

	Design 1	Design 2	Design 3	Design 4
Fixed-capital investment	Rs.10,000	Rs.12,000	Rs.14,000	Rs.16,000
Sum of operating and fixed costs per year (all other costs are constant)	3,000	2,800	2,350	2,100

If the company demands a 15% return on any unnecessary investment, which of the four designs should be accepted? [16]

Set No. 3

8. (a) What is optimum economic design? Illustrate the principles of an optimum economic design by means of an example.

   (b) Describe the general procedure for optimizing two independent variables both analytically and graphically. [8+8]

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Code No: M0822/R07

Set No. 4

IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011
CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS
(Chemical Engineering)

Time: 3 hours
Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Compare batch and continuous operation.

   (b) Compare materials of construction with homogeneous metal or alloy with glass lined equipment. [8+8]

2. Explain the factors affecting Investment and production costs. [16]

3. A company has direct production costs equal to 50 percent of total annual sales and fixed charges, overhead, and general expenses equal to Rs. 20,00,000. If management proposes to increase present annual sales of Rs. 80,00,000 by 30 percent with a 20 percent increase in fixed charges, overhead, and general expenses, what annual sales Rupees is required to provide the same gross earnings as the present plant operation? What would be the net profit if the expanded plant were operated at full capacity with an income tax on gross earnings fixed at 38 percent? What would be the net profit for the enlarged plant if total annual sales remained the same as at present? What would be the net profit for the enlarged plant if the total annual sales actually decreased to Rs. 70,00,000? [16]

4. What is the present worth of a series of expenditures made as follows? Rs. 5000 at the end of 1 year; Rs. 6000 at the end of 2 year; Rs. 9500 at the end of 4 year, if money is worth 10%, give your answer by determining the future worth of the present sum in a single payment after 10 years and computing it with the total of the worth after 10 years of the separate expenditures. [16]

5. Self insurance is being considered for one portion of a chemical company. The fixed-capital investment involved is Rs. 2,50,000, and insurance costs for complete protection would amount to Rs. 2,000 per year. If self insurance is used, a reserve fund will be set up under the companys jurisdiction, and annual insurance premiums of Rs. 1,500 would be deposited in this fund under an ordinary annuity plan. All money in the fund can be assumed to earn interest at a compound annual rate of 5%. Neglecting any charges connected with administration of the fund, how much money would be deposited in the fund at the beginning of he program in order to have enough money accumulated to replace a complete Rs. 2,50,000 loss after 10 years. [16]

6. (a) Write about the following depreciation accounting methods:

   i. single unit method
   ii. composite account
   iii. classified account

Set No. 4

     iv. vintage group account

(b) Discuss in detail about the sinking fund method. Compare with straight line method. [8+8]

7. Discuss about the following:

(a) Capitalized cost

(b) Payout period

(c) Rate of return

(d) Net present worth. [4+4+4+4]

8. (a) What is optimum economic design? Illustrate the principles of an optimum economic design by means of an example.

(b) The following equation shows the effect of he variables x and y on the total cost for a particular operation:
$C_T = 2.33x + \frac{11,900}{xy} + 1.86y + 10$
Determine the values of and which will give the least total cost analytically.

                                                                           [8+8]

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