Code No: RR410803 **RR** **Set No. 2**

IV B.Tech I Semester Examinations,November 2010
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. Synthesis gas may be prepared by a continuous, non catalytic conversion of any hydrocarbon by means of controlled partial combustion in a fire-bride lined reactor. The hydrocarbon and oxidant (oxygen or air) are separately pre heated and charged to the reactor. Before entering the reaction zone the tow feed stocks are intimately mixed in a combustion chamber. The heat produced by combustion part of the hydrocarbon pyrolyzes remaining hydrocarbons into gas and a small amount of carbon in reaction zone. The reactor efficient then passes through a waste heat boiler, a water-wash carbon-removal unit, and a water cooler-scrubber. Carbon is recovered in equipment of simple design in a firm which can be used as fuel or in ordinary carbon products. Prepare a simplified equipment flow sheet in the process, with temperatures-and pressure. [16]

2. Explain the following [8+8]
   (a) Optimum conditions in cyclic operations.
   (b) Optimum conditions in semi cyclic operations.

3. (a) Suggest various ways of adjustment of depreciation accounts to take care of the difference between estimated and actual service life and salvage value of a property. [6]
   (b) What do you mean by arbitrary methods of depreciation determination? Name them and discuss any one of them in detail including advantage and limitations. [10]

4. (a) Discuss the 'Annual cost' and Present worth methods of selecting alternates. [6]
   (b) Heat exchanger 'A' costs Rs.75,000 with an annual operating cost of Rs.5,000. A second exchanger 'B' costs Rs.1,00,000 with an annual operating cost of Rs.3,000. Both have an estimated service life of 5 years. Exchanger 'A' has a salvage value of Rs.1,000 and exchanger 'B' has a salvage value of Rs.1,500. Money is worth 15 percent. [10]
      i. What is the present worth of the service for 10 years provided by the two alternates?
      ii. What is the present capitalized cost for perpetual service?

5. (a) In transferring the cost of chemical A to the inventory and cost-of-sales accounts, there is a question as to what price applies for the chemical A. What are the three basic methods for handling problems of this type? [6]

(b) On Aug. 1, a concern had 10,000 kg of raw material on hand, which was purchased at a cost of Rs.3.00 per kg. In order to build up the reserve, 8000 kg of additional raw material was purchased on Aug. 15 at a cost of Rs. 2.80 per kg, and 2 days later 6000 kg was purchased from another supplier at Rs. 3.10 per kg. If none of the raw material was used until after the last purchase determine the total cost of 12,000 kg of the raw material on an inventory or cost-of-sales account for the month of August

i. the current-average method,

ii. the "fifo" method, and

iii. the "lifo" method. [10]

6. Self Insurance is being considered for one portion of a chemical company. The fixed-capital investment involved is $ 50,000, and insurance costs for complete protection would amount to $ 400 per year. If Self Insurance is used, a reserve fund will be set up under the company's jurisdiction, and annual insurance premiums of $ 300 will 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 connected with adminstration of the fund, how much money should be deposited in the fund at the beginning of the program in order to have enough money accumulated to replace a complete $ 50,000 loss after 10 years ? [16]

7. (a) Discuss the various components of direct production costs with regard to estimation of total product cost. [10]

(b) The annual direct production costs for a plant are Rs. 2,80,000 and the total annual sales are Rs. 5,60,000. [6]

i. If the product sells at Rs. 40 per unit, what is the direct production cost per unit?

ii. If the gross annual earnings are Rs. 2,00,000 and the corporate income tax requires a 22% normal tax on the gross annual earnings plus 26% surtax on gross earnings above Rs. 25,000, what is the net annual earnings?

8. (a) Write short notes on profitability. [8]

(b) Explain in detail about the design-engineering practice for interest and investment costs. [8]

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Code No: RR410803 **RR** **Set No. 4**

IV B.Tech I Semester Examinations,November 2010
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) Discuss the 'Annual cost' and Present worth methods of selecting alternates. [6]

   (b) Heat exchanger 'A' costs Rs.75,000 with an annual operating cost of Rs.5,000. A second exchanger 'B' costs Rs.1,00,000 with an annual operating cost of Rs.3,000. Both have an estimated service life of 5 years. Exchanger 'A' has a salvage value of Rs.1,000 and exchanger 'B' has a salvage value of Rs.1,500. Money is worth 15 percent. [10]

      i. What is the present worth of the service for 10 years provided by the two alternates?

      ii. What is the present capitalized cost for perpetual service?

2. Synthesis gas may be prepared by a continuous, non catalytic conversion of any hydrocarbon by means of controlled partial combustion in a fire-bride lined reactor. The hydrocarbon and oxidant (oxygen or air) are separately pre heated and charged to the reactor. Before entering the reaction zone the tow feed stocks are intimately mixed in a combustion chamber. The heat produced by combustion part of the hydrocarbon pyrolyzes remaining hydrocarbons into gas and a small amount of carbon in reaction zone. The reactor efficient then passes through a waste heat boiler, a water-wash carbon-removal unit, and a water cooler-scrubber. Carbon is recovered in equipment of simple design in a firm which can be used as fuel or in ordinary carbon products. Prepare a simplified equipment flow sheet in the process, with temperatures-and pressure. [16]

3. Self Insurance is being considered for one portion of a chemical company. The fixed-capital investment involved is $ 50,000, and insurance costs for complete protection would amount to $ 400 per year. If Self Insurance is used, a reserve fund will be set up under the company's jurisdiction, and annual insurance premiums of $ 300 will 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 connected with adminstration of the fund, how much money should be deposited in the fund at the beginning of the program in order to have enough money accumulated to replace a complete $ 50,000 loss after 10 years ? [16]

4. Explain the following [8+8]

   (a) Optimum conditions in cyclic operations.

   (b) Optimum conditions in semi cyclic operations.

5. (a) Discuss the various components of direct production costs with regard to estimation of total product cost. [10]

   (b) The annual direct production costs for a plant are Rs. 2,80,000 and the total annual sales are Rs. 5,60,000. [6]

      i. If the product sells at Rs. 40 per unit, what is the direct production cost per unit?

      ii. If the gross annual earnings are Rs. 2,00,000 and the corporate income tax requires a 22% normal tax on the gross annual earnings plus 26% surtax on gross earnings above Rs. 25,000, what is the net annual earnings?

6. (a) Suggest various ways of adjustment of depreciation accounts to take care of the difference between estimated and actual service life and salvage value of a property. [6]

   (b) What do you mean by arbitrary methods of depreciation determination? Name them and discuss any one of them in detail including advantage and limitations. [10]

7. (a) Write short notes on profitability. [8]

   (b) Explain in detail about the design-engineering practice for interest and investment costs. [8]

8. (a) In transferring the cost of chemical A to the inventory and cost-of-sales accounts, there is a question as to what price applies for the chemical A. What are the three basic methods for handling problems of this type? [6]

   (b) On Aug. 1, a concern had 10,000 kg of raw material on hand, which was purchased at a cost of Rs.3.00 per kg. In order to build up the reserve, 8000 kg of additional raw material was purchased on Aug. 15 at a cost of Rs. 2.80 per kg, and 2 days later 6000 kg was purchased from another supplier at Rs. 3.10 per kg. If none of the raw material was used until after the last purchase determine the total cost of 12,000 kg of the raw material on an inventory or cost-of-sales account for the month of August

      i. the current-average method,

      ii. the "fifo" method, and

      iii. the "lifo" method. [10]

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Code No: RR410803 **RR** **Set No. 1**

IV B.Tech I Semester Examinations,November 2010
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) Write short notes on profitability. [8]
   (b) Explain in detail about the design-engineering practice for interest and investment costs. [8]

2. (a) In transferring the cost of chemical A to the inventory and cost-of-sales accounts, there is a question as to what price applies for the chemical A. What are the three basic methods for handling problems of this type? [6]
   (b) On Aug. 1, a concern had 10,000 kg of raw material on hand, which was purchased at a cost of Rs.3.00 per kg. In order to build up the reserve, 8000 kg of additional raw material was purchased on Aug. 15 at a cost of Rs. 2.80 per kg, and 2 days later 6000 kg was purchased from another supplier at Rs. 3.10 per kg. If none of the raw material was used until after the last purchase determine the total cost of 12,000 kg of the raw material on an inventory or cost-of-sales account for the month of August
      i. the current-average method,
      ii. the "fifo" method, and
      iii. the "lifo" method. [10]

3. (a) Discuss the various components of direct production costs with regard to estimation of total product cost. [10]
   (b) The annual direct production costs for a plant are Rs. 2,80,000 and the total annual sales are Rs. 5,60,000. [6]
      i. If the product sells at Rs. 40 per unit, what is the direct production cost per unit?
      ii. If the gross annual earnings are Rs. 2,00,000 and the corporate income tax requires a 22% normal tax on the gross annual earnings plus 26% surtax on gross earnings above Rs. 25,000, what is the net annual earnings?

4. Synthesis gas may be prepared by a continuous, non catalytic conversion of any hydrocarbon by means of controlled partial combustion in a fire-bride lined reactor. The hydrocarbon and oxidant (oxygen or air) are separately pre heated and charged to the reactor. Before entering the reaction zone the tow feed stocks are intimately mixed in a combustion chamber. The heat produced by combustion part of the hydrocarbon pyrolyzes remaining hydrocarbons into gas and a small amount of carbon in reaction zone. The reactor efficient then passes through a waste heat boiler, a water-wash carbon-removal unit, and a water cooler-scrubber. Carbon is

recovered in equipment of simple design in a firm which can be used as fuel or in ordinary carbon products. Prepare a simplified equipment flow sheet in the process, with temperatures-and pressure. [16]

5. Self Insurance is being considered for one portion of a chemical company. The fixed-capital investment involved is $ 50,000, and insurance costs for complete protection would amount to $ 400 per year. If Self Insurance is used, a reserve fund will be set up under the company's jurisdiction, and annual insurance premiums of $ 300 will 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 connected with adminstration of the fund, how much money should be deposited in the fund at the beginning of the program in order to have enough money accumulated to replace a complete $ 50,000 loss after 10 years ? [16]

6. (a) Suggest various ways of adjustment of depreciation accounts to take care of the difference between estimated and actual service life and salvage value of a property. [6]

   (b) What do you mean by arbitrary methods of depreciation determination? Name them and discuss any one of them in detail including advantage and limitations. [10]

7. (a) Discuss the 'Annual cost' and Present worth methods of selecting alternates. [6]

   (b) Heat exchanger 'A' costs Rs.75,000 with an annual operating cost of Rs.5,000. A second exchanger 'B' costs Rs.1,00,000 with an annual operating cost of Rs.3,000. Both have an estimated service life of 5 years. Exchanger 'A' has a salvage value of Rs.1,000 and exchanger 'B' has a salvage value of Rs.1,500. Money is worth 15 percent. [10]

      i. What is the present worth of the service for 10 years provided by the two alternates?

      ii. What is the present capitalized cost for perpetual service?

8. Explain the following [8+8]

   (a) Optimum conditions in cyclic operations.

   (b) Optimum conditions in semi cyclic operations.

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Code No: RR410803 **RR** **Set No. 3**

IV B.Tech I Semester Examinations,November 2010
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) Discuss the 'Annual cost' and Present worth methods of selecting alternates. [6]

   (b) Heat exchanger 'A' costs Rs.75,000 with an annual operating cost of Rs.5,000. A second exchanger 'B' costs Rs.1,00,000 with an annual operating cost of Rs.3,000. Both have an estimated service life of 5 years. Exchanger 'A' has a salvage value of Rs.1,000 and exchanger 'B' has a salvage value of Rs.1,500. Money is worth 15 percent. [10]

      i. What is the present worth of the service for 10 years provided by the two alternates?

      ii. What is the present capitalized cost for perpetual service?

2. Self Insurance is being considered for one portion of a chemical company. The fixed-capital investment involved is $ 50,000, and insurance costs for complete protection would amount to $ 400 per year. If Self Insurance is used, a reserve fund will be set up under the company's jurisdiction, and annual insurance premiums of $ 300 will 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 connected with adminstration of the fund, how much money should be deposited in the fund at the beginning of the program in order to have enough money accumulated to replace a complete $ 50,000 loss after 10 years ? [16]

3. (a) Suggest various ways of adjustment of depreciation accounts to take care of the difference between estimated and actual service life and salvage value of a property. [6]

   (b) What do you mean by arbitrary methods of depreciation determination? Name them and discuss any one of them in detail including advantage and limitations. [10]

4. Synthesis gas may be prepared by a continuous, non catalytic conversion of any hydrocarbon by means of controlled partial combustion in a fire-bride lined reactor. The hydrocarbon and oxidant (oxygen or air) are separately pre heated and charged to the reactor. Before entering the reaction zone the tow feed stocks are intimately mixed in a combustion chamber. The heat produced by combustion part of the hydrocarbon pyrolyzes remaining hydrocarbons into gas and a small amount of carbon in reaction zone. The reactor efficient then passes through a waste heat boiler, a water-wash carbon-removal unit, and a water cooler-scrubber. Carbon is recovered in equipment of simple design in a firm which can be used as fuel or in

ordinary carbon products. Prepare a simplified equipment flow sheet in the process, with temperatures-and pressure. [16]

5. (a) In transferring the cost of chemical A to the inventory and cost-of-sales accounts, there is a question as to what price applies for the chemical A. What are the three basic methods for handling problems of this type? [6]

   (b) On Aug. 1, a concern had 10,000 kg of raw material on hand, which was purchased at a cost of Rs.3.00 per kg. In order to build up the reserve, 8000 kg of additional raw material was purchased on Aug. 15 at a cost of Rs. 2.80 per kg, and 2 days later 6000 kg was purchased from another supplier at Rs. 3.10 per kg. If none of the raw material was used until after the last purchase determine the total cost of 12,000 kg of the raw material on an inventory or cost-of-sales account for the month of August

      i. the current-average method,
      ii. the "fifo" method, and
      iii. the "lifo" method. [10]

6. (a) Write short notes on profitability. [8]

   (b) Explain in detail about the design-engineering practice for interest and investment costs. [8]

7. Explain the following [8+8]

   (a) Optimum conditions in cyclic operations.

   (b) Optimum conditions in semi cyclic operations.

8. (a) Discuss the various components of direct production costs with regard to estimation of total product cost. [10]

   (b) The annual direct production costs for a plant are Rs. 2,80,000 and the total annual sales are Rs. 5,60,000. [6]

      i. If the product sells at Rs. 40 per unit, what is the direct production cost per unit?
      ii. If the gross annual earnings are Rs. 2,00,000 and the corporate income tax requires a 22% normal tax on the gross annual earnings plus 26% surtax on gross earnings above Rs. 25,000, what is the net annual earnings?

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