

Question bank for PEPM

- Q. 1 a) Describe the cash flow for industrial operations with neat diagram. 4
- b) Describe cumulative cash position with neat diagram. 4
- c) Define cost index. Name the different cost indexes used in chemical industry? 2

Q.2)a) A company has been selling a soap containing 30 percent by weight water at a price of \$10 per 100 kg. freight on board(which means the laundry pays the freight charges). The company offers an equally effective soap containing only 5% water. The water content is of no importance to the laundry and it is willing to accept the soap containing 5% water if the delivered costs are equivalent. If the freight rate is \$0.7 per 100 kg, how much should the company charge the laundry per 100 kg freight on board for the soap containing 5% water?

- b) Write short notes on(2 marks each) 4
- i) Simple and compound interest rates
- ii) Perpetuity and capitalized costs

- Q.3 a) Describe all methods of depreciation in detail(with graphical interpretation) 8
- b) State 1988 U.S. federal income tax law with significance of surtax. 2

Q. 4a) A heat exchanger has been designed and insulation is being considered for the unit. The insulation can be obtained in thickness of 1,2,3 or 4 in. The following data have been determined for the different insulation thicknesses:

	1 in.	2 in.	3 in.	4 in.
Btu/hr saved	300,000	350,000	370,000	380,000
Cost for the installed insulation	\$1200	\$1600	\$1800	\$1870
Annual fixed charges	10 %	10 %	10 %	10 %

What thickness of insulation should be used? The value of the heat is 30 cents per 1,000,000 Btu. The minimum acceptable rate of return is 15 percent and exchanger operates 300 days per year.

Q.5 A catalytic process uses a catalyst which must be regenerated periodically because of reduction in conversion efficiency. The cost of one regeneration is constant at \$750. This figure includes all shutdown and startup costs as well as the cost for the actual regeneration. The feed rate to the reactor is maintained constant at 150 kg/day and the cost for the feed material is \$2.4 per kg. The daily costs for the operation are \$300 and fixed charges are \$1,10,000 per year. Tests on the catalyst shows that the yield of product as kg of product per kg. of feed during first day of operation with the regenerated catalyst is 0.87 and the yield decreases as $0.87/T^{0.25}$ where T is the time in operation expressed in days. The time necessary to shutdown the unit, replace the catalyst and startup the unit is negligible. The value of the product is \$16 per kg. and the plant operates 300 days per year. Assuming no costs are involved other than those mentioned, what is the maximum annual profit that can be obtained under these conditions? 10

Q.6) Water at 3.2×10^6 kg/year is to be obtained from a slurry containing 8 % solids by filtering. The cake will contain 40 % solids. The relationship is $Q=13,000T^{0.5}$, where Q is kg of filtrate water obtained during T hours of filtering time. The cake is not washed. The dumping plus cleaning time is 3 hours and costs \$100. The filtration cost is 40 \$/hr. 10

Find a) cycle time for minimum cost.

b) optimum amount of cake per cycle for minimum cost.

c) cycle time for maximum production.

Q.7 a) If you are appointed a project manager for an organization , how you will tackle the situation? 5

b) Describe in short all five project life cycle phases. 5

Q.8 Write short notes on(5 marks each) 10

i) Project manager as a staff assistant to chief executive

ii) Totally projectised organization.

Q.9a) The purchased cost of a shell and tube heat exchanger with 100 ft² of heating surface was \$3000 in 1980. What will be the purchased cost of a similar heat exchanger with 200 ft² of heating surface in 1980 if purchased cost capacity exponent is 0.6 for surface area ranging from 100 to 400 ft²? (ii) If purchased cost capacity exponent for this type of exchanger is 0.81 for surface areas ranging from 400 to 2000 ft², what will be the purchased cost of the heat exchanger with 1000 ft² of heating surface in 1985? The Marshall and Swift equipment cost index in 1980 was 660 and in 1985 was 790. 5

b) Write short notes on(2 +3) 5

i) Nominal and effective interest rates

ii) Perpetuity and capitalized costs

Q.10) a) A multiple effect evaporator is used for evaporating 400000 kg of water per day from a salt solution. The total initial cost for the first effect is \$18,000 and each additional effect costs \$15,000. The life period is estimated to be 10 years and the salvage value is assumed as zero. The straight line method is used. Fixed charges minus depreciation are 15% yearly based on first cost of the equipment. Steam costs \$ 1.5 per 1000 kg. Annual maintenance charges are 5 % of the initial equipment cost. All other costs are independent of number of effects. The unit will operate 300 days per year. If the kg of water evaporated per kg of steam equals 0.85 X number of effects, determine the optimum number effects for minimum annual cost.

b) For the same problem above , if the MAROR is considered as 20 %, What will be the optimum number of effects? 4

Q. 11 a) The total capital investment for a chemical plant is \$ 1.5 million and the working capital is \$1,00,000. If the plant can produce an average of 9000 kg 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 ration of 1.0?

b) Explain the cash flow diagram and cumulative cash position for a company in short with diagrams.

c) Classify the total product cost and explain in short its different components.

Q.12a) Write short notes on(2 + 2 +3) 7

i) Nominal and effective interest rates

ii) Ordinary and differed annuity

iii) Different sources of capital

b) An annuity due is being used to accumulate money. Interest is compounded at an effective annual rate of 8 % and \$2,000 is deposited at the beginning of each year. What will the total amount of the annuity due be after 5 years?

Q.13 a) The initial cost of the completely installed reactor is \$ 70,000 and salvage value at the end of the useful life is estimated to be \$ 5,000. Excluding depreciation costs for the reactor, the total annual expenses for the plant are \$1,00,000. How many years of useful life should be estimated for the reactor if 12 % of the total annual expenses for the plant are due to cost for reactor depreciation? The straight line method should be used.

c) Ravi purchased an equipment for Rs. 40,000/-. The service life is two years and salvage value assumed to be zero. He has options of choosing any one out of two methods for depreciation. The method 1 assumes equal depreciation each year. The method two assumes two third depreciation for first year and one third for second year. What is NPV of the tax benefit Ravi gets in choosing method 2 instead of method 1. The tax rate is 50 % and interest rate is 10 % per year.

Q.14 Describe all five methods of profitability by stating their definitions, relative advantages and disadvantages. 6

Q.15 (a) A plant produces refrigerators at the rate of P units per day. The variable costs per refrigerator have been found to be $\$ 47.73 + 0.1 \cdot P^{1.2}$. The total daily fixed charges are \$1750 and all other expenses are constant at \$7325 per day. If the selling price per refrigerator is \$173, determine (i) daily profit at a production schedule giving the minimum cost per refrigerator (ii) daily profit at a production schedule giving the maximum daily profit. (iii) the production schedule at the breakeven point. (b) Describe in brief how the different alternative investments are compared based on IROR and MAROR. The terms carry their usual meaning.

Q.16 a) A multiple effect evaporator is to be used for evaporating 400,000 kg of water per day from a salt solution. The total initial cost for the effect is \$20,000 and each additional effect costs \$15,000. The life period is estimated to be 10 years and the salvage value at the end of life period is assumed to be zero. The straight line depreciation method is used. Fixed charges minus depreciation are 15 percent yearly based on the first cost of the equipment. Steam costs \$ 1.6 per 1000 kg. Annual maintenance charges are five percent of initial equipment cost. All other costs are independent of the number of effects. The unit will operate 300 days per year. If the 6

pounds of water evaporated per pound of steam equals $0.85 \times \text{number of effects}$,
determine the optimum number of effects for minimum annual cost.

b) If the minimum acceptable rate of return is considered as 25 percent, what will be optimum number of effects?

Q.17 a) Describe with examples, different criteria used for choosing a plant location.

b) Describe the characteristic features of a project.