



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



VII SEMESTER B.TECH (CHEMICAL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: PROCESS ENGINEERING ECONOMICS [CHE 401]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 100

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- Missing data, if any, may be suitably assumed.

1A.	Develop the expression for the present worth of a series of cash flow forming gradient series.	08
1B.	 A ₹ 5000, 10- year, 8% semiannual bond is purchased at t=0 by a person at par value. After receiving the twelfth dividend, the person sells the bond at a price to yield at 6% nominal rate of return on his original purchase price. (a) What was the selling price? (b) If the person keeps the bond until maturity and redeems it for par value, what approximate nominal rate of return will he have earned? 	08
1C.	Monthly deposits of \gtrless 100 are made into an account paying 4% compounded quarterly. Ten monthly deposits are made. Determine how much money will be accumulated after the last deposit.	04
2A.	Petroleum engineers have been asked to study an oil property, the rights to which have been offered, for sale at \gtrless 1,000,000.The engineers estimate that oil can be obtained for 10 years and an average of \gtrless 250,000 can be realized each year after deducting all the cost for producing the oil with a sinking fund rate of 3% used for the capital recovery of the original investment. Calculate the estimate rate of return. Discuss the significance of the formula used.	09
2B.	Labor costs occur continuously during the year. At the end of each year a new labor contract becomes effective for the following year. Let A _j denote the cumulative labor cost occurring uniformly during year j, where A _j = 1.06 A _{j-1} . If money is worth 10% compounded continuously and A ₁ = ₹ 30000, determine the present worth equivalent for five years of labor costs.	11
3A.	An equipment was purchased for an initial cost of \gtrless 10,500 and the salvage value at the end of 6 years is Rs.500. The gross income obtained from the equipment is \gtrless 3000/ year. Using the method of DDB switching to SLD, determine the after tax rate of return. Use tax rate of 50%.	10
3B.	Starting with the three alternatives, discuss the step by step procedure for finding the best alternative by incremental approach, future worth analysis.	10

4A.	Four investment exclusive and pro- on either A or B MARR of 15% a Cash flow in ₹. EOY 0 1-4	t proposals A, E oposals A and C . Funds available and a present wor CF(A) -20,000 7000	B, C and D are are mutually are e for the investment th analysis, deter CF(B) -30,000 9000	available. A an mutually exclus- ent are limited to mine the recommon CF(C) -25,000 8000	nd B are mutuallyive. D is contingentto ₹ 50,000. Usingmended proposal.CF(D)-20,0008500	12	
4B.	 A plant produces a product at the rate of P units per day. The variable cost per unit is (19.85+0.06 P^{1.2}). Total daily fixed charges are ₹ 1120. If the selling price per unit is Rs.120. Determine (a) The profit /unit of product giving the minimum cost per unit of product. (b) Profit/unit of product giving maximum profit per unit of time. 						
5A.	A process industry has a mixer that has an estimated remaining service life of 10 years. The mixer can be sold for $\overline{\mathbf{x}}$ 7000. If the mixer is kept in service it must be repaired immediately at a cost of $\overline{\mathbf{x}}$ 3000. Operating and maintenance costs will be $\overline{\mathbf{x}}$ 2000/ year after the mixer is repaired. After repairing it, the mixer will have a zero salvage value at the end of the 10 year period. A new mixer will cost $\overline{\mathbf{x}}$ 16,000 will last for 10 years, and will have a $\overline{\mathbf{x}}$ 3000 salvage value at that time. Operating and maintenance costs are $\overline{\mathbf{x}}$ 1000 for the new mixer. The company uses an interest rate of 10% in evaluating investment alternatives by EUAC. Should the company buy the new mixer? Also find the savings.						
5B.	Distinguish between the following terms. (a) Internal and external rate of return (b) Capitalized cash flow and annual cash flow (c) Sinking rate and stipulated interest rate						
5C.	A reactor has a batch production capacity of 15000 units with selling price of ₹ 850 per unit. Variable cost is ₹ 450 per unit. Total fixed cost is ₹ 30, 00,000. Calculate breakeven number of units, breakeven sales and breakeven % capacity.						
6A.	Using the MACRS method of depreciation and seven evaluation periods, calculate the depreciation rates for 6 year period using half year convention.						
6B.	A filtration process is carried out in a leaf filter. The filtering characteristics is given by the equation Q=A (K θ_f) ^{0.6} , where Q is the tons of filtrate obtained per cycle and A is the area of filtration and K =1.35x10 ⁻⁶ . The slurry is to be filtered in a leaf filter (a=1) with a filtration duty of 4800 tons/ year. The cake is not washed. The dumping and assembling time is established at 5.5 hrs. The direct costs for power, labor during filtering and dumping are ₹ 13 per m ² , and annual fixed costs ₹ 19 per m ² . The plant operates for 3600 hour/ year. What is the minimum annual cost, the optimum cycle time by graphical and analytical method?						