



VII SEMESTER B.TECH. (CHEMICAL ENGINEERING)

MAKEUP EXAMINATIONS, JAN 2017

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 may be suitable assumed.

1A.	A person borrows Rs. 4000 and repays the loan with four quarterly payments of Rs. 400 during the first year and four quarterly payments of Rs. 1000 during the second year after receiving Rs. 4000 loan. Determine the effective interest rate for the loan transaction.	04
1B.	A government bond is initially purchased for Rs. 900 and kept for 10 years at which time it matures at a face value of Rs. 1000. During the 10 year period, Rs. 60 is obtained every 6 months. What is the rate of return on the investment?	08
1C.	Derive the expression for the future worth of a series of cash flow forming geometric series.	08
2A.	Define the following terms. quarterly interest rate, perpetuity, conservative interest rate, effective interest rate	04
2B.	A chemical company has a mixed that has an estimated remaining life of 10 years. The mixer can be sold for Rs. 7000. If the mixer is kept in service it must be repaired immediately at cost of Rs. 3000. Operating and maintenance costs will be Rs. 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 Rs. 16,000 will last for 10 years, and will have Rs. 3000 salvage value at that time. Operating and maintenance costs are Rs. 1000 for the new mixer. Determine the best alternative. Use interest rate of 10%.	08
2C.	Write in detail, the step by step procedure for finding the best alternative among the three alternatives by incremental approach, present worth analysis.	08
3A.	An equipment was purchased for Rs. 130,000. It has a total life of 10 years and salvage value of Rs. 20,000. Determine the depreciation charge and book value for all the years using SYD method.	06

3B. A company is having four investment proposals W, X, Y and Z. Proposal W is contingent on acceptance of either proposal Y or proposal Z. The firm has a budget limitation of Rs. 200,000. In addition, proposal Y is contingent on proposal Z, while proposal Z is contingent on either proposal X or proposal Y. Using a MARR of 10%, determine the best alternative using the present worth analysis.

EOY	CF(W)	CF(X)	CF(Y)	CF(Z)
0	Rs -100,000	Rs -160,000	Rs -20,000	Rs -15,000
1	10,000	7,500	3,000	1,000
2	10,000	7,500	3,000	1,500
3	10,000	7,500	3,000	2,000
4	10,000	7,500	3,000	2,500
5	20,000	20,000	3,000	3,000

4A.	An individual receives an annual bonus and deposits in a savings account that pays	06		
	5% compounded continuously. The size of the bonus increases each year at 6%			
	compounded continuously. The initial deposit was Rs.500. Determine how much wi			
	be in the fund after the tenth deposit?			

4B. A mine having 25,000 units of gold has first of Rs. 2,500,000. The gross income for this gold is Rs. 2200/ unit. Operating and maintenance costs are Rs. 1600 /unit. If during the first four years of operation, the mine yields 8,500 units, 6,500 units, 4,000 units and 2500 units of gold respectively, determine the after tax cash flow for all the years. Take depletion percentage as 15% and tax rate as 55%. Use both the methods of depletion.

5A. The ratio of variable cost to total sales is 0.5 and the fixed cost are Rs. 120,000 for a product selling at Rs. 40/ unit. What is the total cost per unit of product?
(a) At maximum capacity of 10,000 units.
(b) At Rs. 200,000 net sales.

5B. The batch production of a chemical product requires a total batch time of 7 hours permitting the operation to be completed in one shift. The annual fixed cost varies with the size of the batch as follows. $CF = 13.5 P_B^{1.5} R_s/$ year Where P_B is the batch size in kg. The pertinent cost affecting the batch size ar Rs. 550 per batch and operating cost of Rs. 18/hour and the other expenses are $P_A^2/10^6 R_s/$ year. Where P_A is annual production. What is the optimum batch size to produce 0.3

million kg per year of the product.

- **6A.** Derive the expression for optimum production rate in terms of minimum cost per unit of production and maximum profit per unit of time.
- 6B. A triple effect evaporator is used for evaporating 250,000 kg water/day form a salt solution. The total initial cost for the first effect is Rs. 15,000 and each additional effect costs Rs. 14,000. Service life of the equipment is 10 years. Annual fixed costs are 18% yearly based on first cost of the equipment. Steam costs are Rs. 0.0049/ kg of steam. Annual maintenance cost are 6% of the initial cost. The plant will operate 310 days/ year. If the kg of water evaporated/ kg of steam is 0.8N, where N is the number of effects. Determine the optimum number of effects and optimum cost.