Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (BIOTECHNOLOGY)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: PROCESS ENGINEERING ECONOMICS AND OPTIMIZATION [BIO 403]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	Would you prefer to have an investment earning 5 percent for 40 years or an investment earning 10 percent for 20 years? Explain	**2M**
1B.	A Rs100 par value bond bears a coupon rate of 12% will mature in 5years. Interest is payable semiannually. Compute the value of the bond if the required rate of return is 15%.	**2M**
1C.	To purchase an equipment in a plant the following proposals are considered all having 6 year life and no salvage value. If MARR is 13% suggest the most desirable using future worth and rate of return on incremental approach.	**6M**

Alternatives	Initial cost (Rs)	Annual operating cost (Rs)
X1	750000	81710
X2	880000	42596
X3	500000	112000
X4	550000	54817
X5	720000	73945

2A.	Explain any one method of increasing the economic efficiency of any industry with an example.	**3M**
2B.	An equipment is insured for Rs 9,00,000 with present annual insurance premium of Rs 0.68 per Rs 100 coverage. A sprinkler system with estimated life of 20 years and has no salvage value costs Rs 18,000.Annual operating & maintenance costs is Rs 450.Taxes are 0.7% of initial cost of equipment. If sprinkler is installed, premium rate will be reduced to Rs 0.35 per Rs 100 coverage. What will be the incremental rate of return if sprinkler system is installed? If MARR is 12%, which alternative should be chosen?	**4M**
2C.	A peristaltic pump costing Rs 80000 with a life of 6.5 yrs having no salvage value requires Rs 4000 for maintenance & operation. If money is worth 9%.What is the capitalized cost for this service assuming perpetual operation?	**3M**
3A.	Explain the assumptions and limitations of breakeven analysis.	**4M**
3B.	The initial cost of a completely installed reactor is 60000 and the salvage value at the end of the useful life is 10000. Excluding depreciation charges the total annual expenses for the plant are Rs 100000. How	**3M**

	many years of useful life should be estimated for the reactor if 12% of total annual expenses for the plant are due to the cost for reactor depreciation. The straight line depreciation should be used.	
3C.	Capital investment of a biochemical plant which will produce Rs 1500000worth goods/year is estimated to be 2 million. It will be necessary to do a considerable amount of research and development on the project before the final plant can be constructed and management wishes to estimate the permissible R&D cost. It ha been decided that the net profits from the plant should be sufficient to pay off the total capital investment plus all R & D costs in 7 years. A return after taxes of at least 12% of sales must be obtained and 50% R&D cost is tax free (Income Tax rate is 50%). Under these conditions what is the total amount that the company can afford to pay for R&D.	**3M**
4A.	XYZ company has an annual production of 5,00,000 cases of 32 microtips each. If a packing machine costing Rs 8,00,000 is purchased with an estimated life of 6 years, what is the depreciation charge per microtip, for the packing operation?	**3M**
4B.	An ice making machine having a salvage value of Rs 5000 is estimated to have a service life of 11 years. The original cost of the machine was Rs 75,000. Determine (a) Depreciation charge for 6^{th} year if 175% DBM is used. (c) Percentage original investment paid off in the first half of service life using SYD	**4M**
4C.	How do you account for loss of natural resources over a period of time?	**3M**
5A.	Find the current estimated cost for a hot air steel drier to handle 10 tons/hr of a waste material containing 50% moisture, which can, indicate that the rotary drier will produce the product with 10kg of water evaporated per hour per m^2 of peripheral drier area.	**4M**
5B.	The following equations shows the effect of variables P and R on the total cost for a particular operation. $C_T = 3.72P+2946/PR +29.73R$. Determine the values of P and R which gives the least cost.	**3M**
5C.	86000kgwater/day is to be evaporated from caustic soda solution. One kg of steam will evaporate 0.7Nkg of water where N is the number of effects. Steam costs are Rs 4 per 500kg. Cost of the first effect is Rs 15000 and each additional effect will cost Rs 12000. The estimated life is 10 years with no salvage value. The average annual costs for maintenance and repairs are 10% of the first cost. The plant is expected to run for 300 days in a year. Compute the optimum number of effects for minimum annual costs assuming 12% interest rate after taxes and straight line depreciation.	**3M**
6A.	Consider the following problem involving the activities shown below. **List of Activities**: A B C D E F G H I J K L M N P Q **Intermediate Predecessor**: - - - B B A,D A,D B C,E C,E F G H,I G H,I J K L M N **Duration (months)**: 1 4 2 2 3 3 2 1 3 2 3 6 5 2 4 7 (a) Construct the CPM network and determine the critical path. (b) List the differences between PERT and CPM	**4M**
6B.	A plant has to be built to produce $3*10^6$ liter of a liquid chemical per year. The total cost of the plant is estimated to be Rs 6000000. The fixed expenses are to be Rs 600000 per year and the variable expenses are to be Rs 1 per liter. The regulated expenses connected into sales etc are expected at Rs 500000 per year with zero production and vary linearly to Rs 170000 at full production. The expected selling price is Rs 2.50 per liter. (a) Calculate the production level for breakeven. (b) At what production level the operation must be stopped if the production level is to be maintained at Rs 2.50 per liter. (c) At what production level will a 20% annual return be achieved at a selling price of Rs 3 per liter.	**6M**