Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

VII SEMESTER B.TECH. (COMMON TO ALL)

END SEMESTER EXAMINATIONS- JAN 2021 (ONLINE)

SUBJECT: ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [HUM 4002]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Interest factor table is provided in the last page (**else use formulae**).

1A. Given the cash flow of an equipment which has a first cost of Rs. 150,000 and a salvage value (S) in Rupees, described by S= 120,000 – 20,000k, where k is the number of years since it was purchased. The salvage value does not go below zero. Determine its economic service life at an interest rate of 12% per year. Note that the equipment will have a maximum service life of 8 years. **(05)**

Years of Service	O&M Costs (Rs.)
1	72000
2	74000
3	76000
4	78000
5	80000
6	84000
7	88000
8	92000

1B. The following equation describes the conversion of a cash flow into a Present Worth series, **(05)**

$$P = 50(P/A,15\%,20) + (10+10(A/G,15\%,15))*(P/A,15\%,15)*(P/F,15\%,5) - 50 - 75(P/A,15\%,5) - (80+10(A/G,15\%,6))*(P/A,15\%,6)*(P/F,15\%,5) - (55 + 5(A/G,15\%,6))*(P/A,15\%,6)*(P/F,15\%,11) - (90-10(A/G, 15\%,3)) *(P/A,15\%,3) * (P/F,15\%,17).$$

Reconstruct the original cash flow diagram.

2A. Determine the sales of a firm given the following information: **(05)**

Current ratio: 1.6
Acid test ratio : 1.4
Current liabilities : 18000
Inventory turn-over ratio : 6

2B. Using the declining balance method (depreciation rate (α) = 0.3) for automated process control equipment with initial cost of $175,000, useful life =5 years, and Salvage value = $32,000. Calculate the annual depreciation amount and book values as a five-year schedule. **(05)**

3A. Explain briefly and clearly how the topics we have covered under 'Time value of Money' and 'Evaluation of alternatives' might help you, for example, while making a decision evaluating education loans in various banks to pay for your post graduate studies. **(05)**

3B. A road building contractor has received a major highway construction contract for some asphalt paving, based on a specification. Three paving subcontractors quoted the following prices and terms of payment: **(05)**

Paving Co.	Price	Payment schedule
Quick	$85000	50% payable immediately 25% payable in six months 25% payable at the end of one year
Tartan	$82000	Payable immediately
Faultless	$84000	25% payable immediately 75% payable in six months

If the contractor uses a 12% nominal interest rate, compounded monthly, on the basis of present worth analysis, which paving subcontractor should be awarded the paving work?

4A. A metal plating company is considering five different methods for recovering byproduct heavy metals from a manufacturing site 's liquid waste. An engineer is considering the projects, all of which can be considered to last perpetually. If the metal plating company's MARR is 12% per year, determine which should be selected (a) if they are independent and (b) if they are mutually exclusive? Use Rate of return method. **(05)**

	First Cost, ($)	Annual Income, $/year	Alternative's Rate of Return, %
A	- 20,000	+3,000	15
B	- 10,000	+2,000	20
C	- 15,000	+2,800	18.7
D	- 70,000	+10,000	14.3
E	- 50,000	+6,000	12

4B.	A person would like to receive Rs.30000 monthly as pension after his retirement (60 years). To receive this amount, he plans to invest some equal amount every quarter when he attains the age of 42. He continued this investment for 5 years. However, after 5 years he doubles the investment amount but invests with a frequency of semi-annual period for the next 10 years. During the last three years of his service, he invests an amount five times his initial investment, on a monthly basis. Assuming that he lives for 20 years after retirement, calculate the amount to be invested if the interest rate is 7 percent per annum compounded monthly during the first fifteen years and increases to 12 percent per annum compounded monthly thereafter.	**(05)**
5A.	Production of Air filters requires the machine (that produces air filters) to be turned off by the operator, after each piece is completed. The machine coasts for 15 seconds after it is turned off thus preventing the operator from removing the piece quickly before producing the next piece. Installing a brake could prevent the time lost. That would reduce the coasting time to 03 (three) seconds. The machine produces 55,000 filters a year. The time taken to produce one piece is 1 minute and 35 seconds, excluding coasting time. The operator earns $8.00 per hour. In addition, $4 an hour is incurred for operating the machine as direct cost. For every 600 hours of operation, the brake will require servicing. The maintenance of the brake takes 40 minutes for the operator and will cost $45 in parts and material. The brake is expected to last 7500 hours of operation with proper maintenance and will have no salvage value. How much could be spent for the brake if the minimum attractive rate of return is 12% compounded annually.	**(05)**
5B.	Let, **X** = Last 4 digits of your registration number **Y** = Last 3 digits of your registration number Certain kind of machine has a first-year maintenance cost of **X** which increases by **Y** per year over the 10-year useful life of the machine. Answer the following if the firm's interest rate is 12%: i. What equal annual payments could the firm make to a service organization to carry out the maintenance for 5 machines? ii. How much additionally could be paid for a new type of machine with the same useful life that requires no maintenance during its life?	**(05)**