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**MANIPAL INSTITUTE OF TECHNOLOGY**  
MANIPAL

**V SEMESTER B.TECH. (COMMON TO ALL)**

**END SEMESTER EXAMINATIONS- NOVEMBER 2022**

**SUBJECT: ENGINEERING ECONOMICS & FINANCIAL MANAGEMENT**

**[HUM 3051]**

**REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

**Instructions to Candidates:**

- ❖ Answer **ALL** the questions.
- ❖ Interest factor table are provided, for others use formulae
- ❖ Missing data may be suitably assumed.

<b>1A)</b>	A mining company has purchased an excavator at Rs. 1 Crore which has a depreciable life of 10 years. The company is following 15% declining balance method. Assuming zero salvage value at the end of depreciable life, calculate the amount of depreciation and book value for all the years. What would be the depreciation charge every year, if the company adopts a straight line method of depreciation for this excavator?	<b>(05)</b>
<b>1B)</b>	Define and state the significance of interest coverage ratio, inventory turnover ratio, and return on investment ratio.	<b>(03)</b>
<b>1C)</b>	Explain the terms Sunk cost and Capital recovery cost which are considered to be key elements in replacement analysis.	<b>(02)</b>
<b>2A)</b>	Assume that you have borrowed a short-term loan of Rs. 1 Lakh with an interest rate of 2% per month. What is the effective annual interest rate and how much money need to be repaid at the end of six months?	<b>(02)</b>
<b>2B)</b>	ABC International is considering obtaining a color copier, and it can do so either with a lease or an outright purchase. The lease involves a series of payments over the three-year useful life of the copier, while the purchase option involves more cash up-front and some continuing maintenance, but it	<b>(03)</b>

	<p>also has a resale value at the end of its useful life. Evaluate the alternatives and recommend whether to lease or buy the copier based on ROR method. The company's MARR is 15%.</p> <table border="1"> <thead> <tr> <th>Year</th><th>Lease</th><th>Buy</th></tr> </thead> <tbody> <tr> <td>0</td><td>-7,000</td><td>-29,000</td></tr> <tr> <td>1</td><td>-7,000</td><td>-1,500</td></tr> <tr> <td>2</td><td>-7,000</td><td>-1,500</td></tr> <tr> <td>3</td><td>-7,000</td><td>-1,500</td></tr> <tr> <td>Resale</td><td></td><td>12,000</td></tr> </tbody> </table>	Year	Lease	Buy	0	-7,000	-29,000	1	-7,000	-1,500	2	-7,000	-1,500	3	-7,000	-1,500	Resale		12,000							
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<b>2C)</b>	<p>Selected financial information about ABC Company is given below:</p> <table border="1"> <thead> <tr> <th><i>Currency in Rs.</i></th><th>20X2</th><th>20X1</th></tr> </thead> <tbody> <tr> <td>Sales</td><td>2,07,000</td><td>1,29,000</td></tr> <tr> <td>Cost of goods sold</td><td>1,71,000</td><td>97,500</td></tr> <tr> <td>Inventories</td><td>34,200</td><td>16,500</td></tr> <tr> <td>Trade receivables</td><td>21,600</td><td>9,000</td></tr> <tr> <td>Cash</td><td>4,500</td><td>2,400</td></tr> <tr> <td>Other current assets</td><td>12,000</td><td>8,100</td></tr> <tr> <td>Current liabilities</td><td>48,000</td><td>33,000</td></tr> </tbody> </table> <p>In 20X1, the company had receivables of `7,500 and inventories of `9,000. Required</p> <p><b>a)</b> Compute the current ratio, quick ratio, average collection period, and inventory turnover for 20X1 and 20X2.</p> <p><b>b)</b> State whether there is a favourable or unfavourable change in liquidity from 20X1 to 20X2.</p>	<i>Currency in Rs.</i>	20X2	20X1	Sales	2,07,000	1,29,000	Cost of goods sold	1,71,000	97,500	Inventories	34,200	16,500	Trade receivables	21,600	9,000	Cash	4,500	2,400	Other current assets	12,000	8,100	Current liabilities	48,000	33,000	<b>(05)</b>
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<b>3A)</b>	<p>There are two alternatives before the government for laying a road within the city viz. concrete road or bitumen road. 40-meter-wide concrete road has an initial cost of Rs. 10 Crores per kilometer, annual maintenance cost of Rs. 5 Lakhs which increases by 1 Lakh every year from 5<sup>th</sup> year onwards, onetime expenditure of 50 Lakhs at the end of 10<sup>th</sup> year and a life of 20 years. Bitumen road has an initial cost of Rs. 3 Crores per kilometer, annual maintenance cost of Rs. 75 Lakhs which increases by 30 Lakhs every year from the second year onwards and life of 5 years. If the interest rate is 8% which alternative should be selected based on annual worth analysis.</p>	<b>(04)</b>																								

<b>3B)</b>	You are going to buy a new car worth \$14,500. The dealer computes your monthly payment to be \$267 for 72 months' financing. What is the dealer's rate of return on this loan transaction?	<b>(03)</b>
<b>3C)</b>	<p>A newly constructed bridge costs \$5,000,000. The same bridge is estimated to need renovation every 15 years at a cost of \$1,000,000. Annual repairs and maintenance are estimated to be \$100,000 per year.</p> <p>a) If the interest rate is 8%, determine the capitalized cost of the bridge.</p> <p>b) Suppose that, in (a), the bridge must be renovated every 20 years, not every 15 years. What is the capitalized cost of the bridge?</p>	<b>(03)</b>
<b>4A)</b>	<p>A car purchased six years ago can be sold now for 3.5 lakhs, or can be kept for another five years. In that case, it will have an annual operation and maintenance cost of Rs. 50,000 for the first year of operation from now and increases every year by an amount of 20,000. It is expected to have a salvage value of Rs. 2.25 Lakhs, Rs. 2 Lakhs, Rs. 1.75 Lakhs, Rs. 1.5 Lakhs, Rs. 1.25 Lakhs for years seven to eleven respectively.</p> <p>A suitable replacement is priced at Rs. 8 Lakhs and an annual operation and maintenance cost of Rs. 30,000. The salvage value of the car is Rs. 5 Lakhs after five years.?</p> <p><b>You are required to:</b> Determine the economic service life of the old car.</p>	<b>(04)</b>
<b>4B)</b>	<p>A car purchased six years ago can be sold now for 3.5 lakhs, or can be kept for another five years. In that case, it will have an annual operation and maintenance cost of Rs. 50,000 for the first year of operation from now and increases every year by an amount of 20,000. It is expected to have a salvage value of Rs. 2.25 Lakhs, Rs. 2 Lakhs, Rs. 1.75 Lakhs, Rs. 1.5 Lakhs, Rs. 1.25 Lakhs for years seven to eleven respectively.</p> <p>A suitable replacement is priced at Rs. 8 Lakhs and an annual operation and maintenance cost of Rs. 30,000. The salvage value of the car is Rs. 5 Lakhs after five years?</p> <p><b>You are required to:</b></p> <p>Using outsider's point of view (Opportunity cost) approach, examine whether it is financially viable to make replacement at an interest rate of 8%</p>	<b>(03)</b>
<b>4C)</b>	A new company estimates that by investing in a new process, it will increase its sales by \$1.5 million one year from now and then by \$1 million for every semi-annual from one and half (1.5) years till the end of 3 years. To compensate the risk and market dynamics, the company sets a higher of MARR at 19.50% per year, compounded quarterly, what is the maximum	<b>(03)</b>

	amount the company can afford to spend now on the new process in order to break even?	
<b>5A)</b>	<p>Two methods of weed control in an irrigation waterway are under consideration. Method A involves lining the waterway at a cost of \$30,000. The lining is expected to last 20 years. Maintenance with this method will cost \$2 per mile per year. Method B involves spraying a chemical which costs \$45 per gallon, with one gallon capable of treating 10 miles. Spraying equipment will cost \$2,500 and will have a life of 3 years with no salvage value. At an interest rate of 10% per year,</p> <p><b>a)</b> For how many miles of waterway will both the methods break-even?</p> <p><b>b)</b> If 400 miles of waterway must be treated each year, which method should be selected?</p>	<b>(04)</b>
<b>5B)</b>	<p>An employee working for a Public Sector Undertaking (PSU) has to choose between opting for Voluntary Retirement Scheme (VRS) and working till the stipulated age of retirement. Current age of the employee is 55 and can work till the completion of 65 years. VRS offers a onetime payment of 125% of the current salary for the balance period of the service. If the employee chooses not to retire can expect that the salary increases at an annual gradient of 2 Lakhs. If the current salary of the employee is Rs. 15 Lakhs per annum and an interest rate of 8%, which option is financially attractive for the employee?</p>	<b>(04)</b>
<b>5C)</b>	<p>A bank with an 8% risk-free rate of return intends to add a 5% annual risk premium, so that the bank's interest charge per year on an unsecured loan is the sum of these two components. If a bank lends 50 lakhs with a maturity period of 15 years. What should be the annual amount that the bank should recover for this lending until it matures?</p>	<b>(02)</b>
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