BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) FOURTH YEAR

SECOND SEMESTER – 2025

Subject : ENGINEERING ECONOMICS AND COSTING **Time : 3 Hours Full Marks : 100**

Instructions: ANSWER ANY FIVE QUESTIONS. ONLY THE FIRST FIVE ANSWERED QUESTIONS SHALL BE EXAMINED; THE REST SHALL BE IGNORED.

1. A) Explain how applying economic concepts enhances decision-making in engineering projects, leading to cost-effective and efficient solutions.

   B) How do scarcity and opportunity cost influence the fulfilment of human wants?

   C) Critically explore how laissez-faire principles leverage individual choices and market dynamics to manage resources without centralized control.

8+6+6

2. A) How does the Cobb-Douglas production function illustrate the relationship between input factors and output in an economy?

   B) TECHNOVATE Co. uses the production function: $Q = 100A^{0.4}B^{0.6}$, where Q is the number of smartphones assembled per day, A represents hours of automated assembly line usage, and B represents hours of skilled labour input. Its competitor, DIGIMAX Ltd., employs the production function: $Q = 100A^{0.6}B^{0.4}$.

   i) If both companies deploy the same quantity of automated hours and labor hours, which one achieves higher output?
   ii) Suppose automated hours are restricted to 10 per day, while skilled labor is available in unlimited supply. In which company is the marginal product of labour higher under this constraint? Justify your answer.

   C) GREENPACK Industries manufactures eco-friendly packaging cartons. In the short run, the number of packaging machines is fixed. The company observes the following changes in daily output as the number of workers increases from 1 to 8:
   Cartons Produced: 15, 30, 48, 62, 74, 87, 96, 103
   i) Calculate the marginal product (MP) and average product (AP) of labor for each level of employment.
   ii) Illustrate the trends of MP and AP graphically and interpret the economic implications of your findings.

4+ (4+4)+(4+4)

3. A) Identify and explain the main factors that influence demand, using real-world examples to show how changes in these factors lead to increases or decreases in the quantity of a product that buyers are willing and able to purchase.

   B) Explain the concept of cross-price elasticity of demand. Illustrate your answer with one example where two goods compete with each other and another where the use of one good depends on the use of the other.

   C) MECHANIX Engineering reduced the price of its precision tools from Rs 500 per unit to Rs 450 to attract more buyers. As a result, the demand for the tools increased from 300 units to 360 units. Calculate the price elasticity of demand for the tools and assess whether the demand is elastic, inelastic, or unitary.

   D) You decide to invest Rs 500,000 in a corporate bond fund offered by Precision Machinery Corp., which offers an annual interest rate of 9%, compounded quarterly. You plan to withdraw the funds after one year and pay the income tax on the interest earned. You fall under the 10% tax bracket.

6+6+4+4

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4. A) Discuss the connection between inflation and the time value of money, and explain how inflation erodes purchasing power, altering the real value of money in the future.

B) Analyse the trade-off between inflation and unemployment depicted by the Phillips Curve, and discuss its economic implications for policy-making and market stability.

C) Describe the Quantity Theory of Money.

D) VIBRANT ENGINEERING Pvt. Ltd., a leading mechanical manufacturing company in India, approaches ICICI Bank for a term loan of Rs. 3,50,00,000 to expand its production facility. The bank offers an interest rate of 9% per annum for a tenure of 5 years. Calculate the total interest payable and the monthly instalment using the simple interest method.

7+5+5+3

5. A) Examine the role of commercial banks in fostering industrial development in India. Discuss how they support the growth of manufacturing and other industries by providing essential financial services such as loans, credit facilities, and investment options.

B) The Reserve Bank of India increases the repo rate from 4.5% to 5.5%. Calculate the new monthly EMI on a Rs. 2,000,000 business loan over 10 years using the EMI formula.

C) What are the key features and advantages of a joint-stock company on the global stage? Explore the fundamental characteristics and benefits of joint-stock companies, and provide a global example of a successful joint-stock company, highlighting its market influence and economic impact.

D) Discuss how key management principles contribute to sound financial decision-making in mechanical companies in India, focusing on resource allocation, cost management, and profitability.

E) Explain the concept of mergers and acquisitions in the context of Indian businesses, providing examples from various industries. Discuss how these strategic moves help organizations enhance market share, expand into new markets, and achieve greater efficiency, along with the challenges and benefits they present.

5+3+4+4+4

6. A) Create journal entries for the following transactions in a Kolkata-based manufacturing company:
i) Purchased raw materials on credit for Rs 3,50,000.
ii) Sold finished goods for cash, realizing Rs 6,00,000 in revenue.

B) Develop a simple Trading Account for a U.S.-based company with the following information:
Opening Stock: $8,000
Purchases: $25,000
Sales: $40,000
Closing Stock: $10,000

C) XYZ Ltd., a manufacturing company in Europe, has the following balances as of December 31, 2023:
Opening Stock: €15,000
Purchases: €60,000
Sales: €90,000
Returns Inward: €5,000
Returns Outward: €3,000
Carriage Inwards: €1,500
Carriage Outwards: €1,000
Salaries: €18,000
Rent: €3,000
Bad Debts: €1,500
Discount Allowed: €2,000
Discount Received: €1,200

Other balances:

Capital: €120,000
Drawings: €10,000
Debtors: €20,000
Creditors: €8,000
Cash: €4,000
Bank: €6,000

i) Calculate the Net Profit for the year.
ii) Find the Closing Capital as of December 31, 2023.

4+4+(6+6)

7. A) Delta Engineering Pvt. Ltd., a mid-sized manufacturing firm, pays its workers an average hourly wage of ₹600. During the financial year, the total hours worked amounted to 45,000. In addition, the company incurs ₹8,000 on overtime wages and ₹15,000 on employee benefits. Calculate the total labour cost for Delta Engineering Pvt. Ltd. for the year.

B) As a financial analyst at Rajdeep Tech Solutions, you are evaluating three proposed capital investment plans to expand operations in India. The projects under consideration are:

i) Project Surya requires an upfront investment of ₹35 lakhs and is projected to yield annual cash flows of ₹12 lakhs for the next 5 years.
ii) Project Vayu needs an initial investment of ₹60 lakhs and is estimated to produce cash flows of ₹20 lakhs per year for the next 7 years.
iii) Project Agni calls for an initial outlay of ₹80 lakhs and is expected to generate ₹28 lakhs annually for the next 10 years.
Assume a discount rate of 10%. Calculate the Net Present Value (NPV) of each project and rank the projects in order of preference based on their NPVs.

C) Pranav Engineering Works shares the following financial details for the fiscal year ending March 31, 2024:
Total Assets: ₹6,500,000
Total Liabilities: ₹2,800,000
Net Revenue: ₹12,000,000
Cost of Goods Sold (COGS): ₹6,000,000
Operating Expenses: ₹2,400,000
Interest Paid: ₹150,000
Income Tax Paid: ₹600,000
Average Inventory: ₹1,200,000
Average Trade Receivables: ₹950,000
Average Trade Payables: ₹700,000
Average Shareholders' Equity: ₹3,700,000
Based on the given data, compute the following financial ratios:
i) Current Ratio
ii) Quick Ratio
iii) Gross Profit Margin
iv) Net Profit Margin

2+(3+3)+(3+3+3+3)

8. Write short notes on **any four** of the following topics:
i) Achieving Production Efficiency: The Quest for Factor Optimization
ii) Forecasting Market Behaviour: The Strategic Role of Demand Estimation
iii) Inflation Unveiled: Root Triggers and Ripple Effects on the Economy
iv) Catalyst for Growth: Credit as a Lifeline for Industrial Ecosystems
v) Banking Reinvented: The Transformative Role of AI and Big Data
vi) Solo Ventures: Significance and Challenges of Proprietorship Models
vii) Fiscal Tools in Motion: The Industrial Impact of Taxation and Risk Coverage

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