

M.E. AUTOMOBILE ENGINEERING FIRST YEAR FIRST SEMESTER EXAM 2025

AUTOMOTIVE MATERIALS AND MANUFACTURING TECHNOLOGY

Time: 3 Hours

Full Marks: 100

Assume any relevant data, if necessary. Symbols in the Question Paper carry their usual meanings. Figures in the margin indicate full marks.

Use Separate Answer scripts for each Group / Part

PART-I

Answer any five questions

- Q1. State the requirements of non-traditional machining process. Explain the differences between non-traditional machining process and traditional machining process? Classify non-traditional machining process. 3+3+4=10
- Q2. Explain the working principle of Electro Discharge Machining (EDM) with a neat sketch. Explain the function of dielectric fluid used in EDM. 6+4=10
- Q3. In an electrochemical machining (ECM) process with a pure iron workpiece, a removal rate of $5\text{cm}^3/\text{min}$ is desired. Determine the current required. Also deduce the formula required. The gram atomic weight, valency and density of iron are 56 gm, 2, and 78 gm/cm^3 respectively. 5+5=10
- Q4. Prove that $Q = \chi Z d^3 v^{3/2} \left(\frac{\rho}{12H_w} \right)^{3/4}$, where Z is the number of abrasive particles impacting per unit time, d is the mean diameter of the abrasive grains, v is the velocity of the abrasive grains, ρ is the density of the abrasive material, H_w is the hardness of the work material (the flow stress), and χ is a constant. 10
- Q5. Define Hybrid manufacturing process (HMP). Classify HMPs. Briefly explain the principle of Electrochemical grinding process. 2+3+5=10
- Q6. Define micromachining. Compare Electrochemical machining and Electrochemical micromachining. 3+7=10
- Q7. Write Short Notes on (any two): 2×5=10
(i) Laser Beam Machining (ii) Factors that affect MRR in ECM (iii) Electro Chemical Discharge Machining (ECDM).

PART-II

Answer any five questions

- Q1. Draw the pie chart of the weight breakdown of a typical automobile. Steel as an automotive material is consumed in which segment? Show the progression of utilization of high-strength steel grades in automobiles. 5+2+3=10
- Q2. What are the early materials being used in automobile industry? Explain how subsequent changes have been incorporated in those early materials. What are the different aluminium alloys used in automobile body panels? 3+3+4=10
- Q3. What do you mean by hybrid material designs? What is the role of carbon fiber in material designs? What are sandwich materials in the perspective of automotive materials? 3+3+4=10
- Q4. What are the selection criteria of materials in automobile? What are the advantages of steel as an automotive material? 5+5=10
- Q5. What are the future materials automotive engineering? What are the important issues for environmental protection in automotive engineering? 5+5=10
- Q6. Write down the reason for choosing Magnesium, polymers, and composites as automotive materials, along with their zone of application in automobiles and their advantages/ disadvantages. 10