1717

April 2025

Time – Three hours
(Maximum Marks: 100)

N.B. Answer all the questions, choosing any two subdivision from each question. Each subdivision carries 10 marks.

1. (a) Explain any five mechanical properties of engineering materials.

   (b) Classify force systems and explain.

   (c) Draw and explain stress strain diagram of mild steel.

   (d) A steel rod 1m long 20mm x 20mm in cross section is subjected to a tensile force of 40kN. Determine the elongation of the rod if modulus of elasticity for the rod material is 200GPa.

2. (a) Define the following: bulk modulus, Poisson's ratio and volumetric strain.

   (b) Determine the changes in length, breadth and thickness of a steel bar which is 4m long, 30mm wide and 20mm thick is subjected to an axial pull of 30kN in the direction of its length. Take $E=2\times10^5$ N/mm^2 mm^2 and Poison's ratio is 0.3

   (c) (i) For a material, Young's modulus is given as 1.2×10^5 N/mm^2 and Poison's ratio 0.25, calculate the bulk modulus. (6)

   (ii) Write about the elastic constants and their relationship. (4)

   (d) A steel rod of 30 mm diameter is enclosed centrally in a hollow copper tube of external diameter 50 mm and internal diameter of 40 mm. The composite bar is then subjected to an axial pull of 45kN. If the length of each bar is equal to 150 mm, determine the stresses induced in the rod and tube.

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3. (a) (i) State Ohm's law and explain it with a neat sketch. (4)
(ii) Define voltage,current and power. (6)

(b) Explain capacitors in series and parallel.

(c) Explain about the symbols, working principle of inductor and mention its uses.

(d) Explain self and mutual inductance.

4. (a) Explain about energy band of semi conductors.

(b) Explain the P type and N type semi conductor with neat sketch.

(c) Explain the construction and working of Zener diode.

(d) Explain the VI characteristics of PN junction diode.

5. (a) Discuss the hazards of electricity.

(b) Explain the protective devices for electrical shock.

(c) Describe the steps involved in preparation of PCB.

(d) Explain the precautions for soldering safety.
