

1079

B.E. (Mechanical) First Semester  
ME-101: Engineering Mechanics – I

Time allowed: 3 Hours

Max. Marks: 50

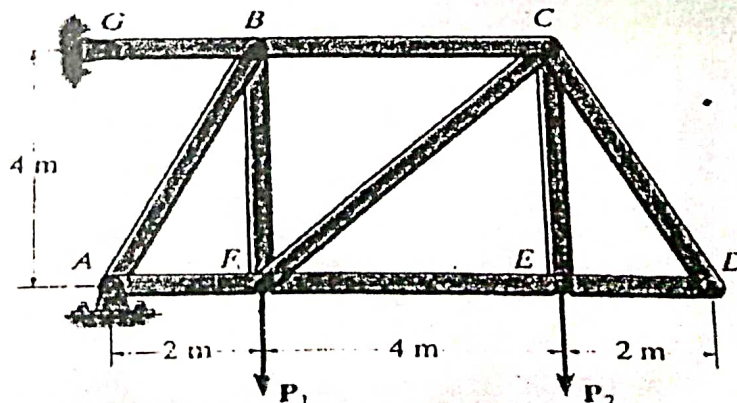
**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

1. (a) Define the following:
  - (i) Significant figures
  - (ii) Point of contraflexure
- (b) State parallel axis theorem.
- (c) State varignon's theorem.
- (d) What are free body diagrams?
- (e) What are conservative forces? (2 X 5 = 10)

**PART-A**

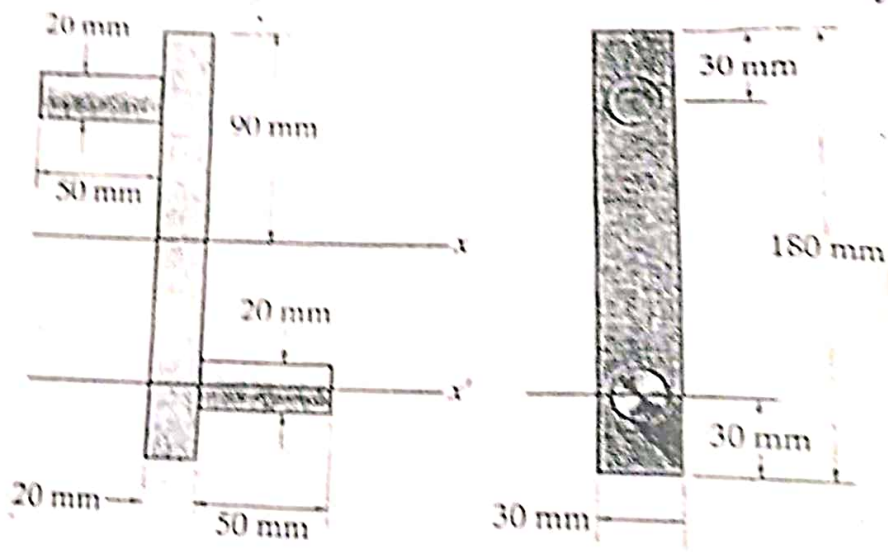
2. (a) Define the term 'position vectors'. (2)  
(b) Discuss free body diagrams? (3)  
(c) State and prove Lami's theorem. (5)
3. (a) The resultant of two forces, magnitude of one of which is double than the other has been measured as 260 N. If the direction of larger force is reversed and the other remains constant, the resultant reduces to 180 N. Determine the magnitude of forces and angle between the forces. (5)  
(b) Three forces having magnitude of 1 kN, 2 kN and 3 kN respectively acting in order along the three sides of an equilateral triangle. Make calculations for magnitude, direction and position of their resultant. (5)
4. (a) What are various assumptions made for analyzing framed structures? (3)  
(b) Determine the force in each member of the truss as shown in figure and state if the members are in tension or compression. Take  $P_1 = 100$  N,  $P_2 = 200$  N. (7)



5. (a) What are cables?  
 (b) Give relations between distributed load, shear and moment.  
 (c) Draw shear force and bending moment diagrams for the beam shown below.



6. (a) What is a Mohr's circle for moment of inertia?  
 (b) Define mass moment of inertia.  
 (b) Determine the moment of inertia of the overhung crank about  $x'$  axis. The material of the beam is steel having a density of  $7.85 \text{ mg/m}^3$ .



7. (a) A body consists of a hemisphere of radius 5 cm and right circular solid cone of height 10 cm. The hemisphere and cone has a common base and are made of same material. Locate the position of center of gravity of the composite body.  
 (b) Two rods AB and BC have centers of mass located at their mid points. If all contacting surfaces are smooth and BC has a mass of 100 kg, determine the appropriate mass of AB required for equilibrium.

