Ref. No.: Ex/CE/PC/B/T/214/2025

B.E. Civil Engineering ,Second Year ,First Semester Examination 2025

SUBJECT – Structural Mechanics I

Time : Three hours | Part - I | Full Marks : 100

(50 marks for this part)
Answer any two questions

(Each question carries 25 marks)

1. Analyze the truss as shown in the Figure I given below and tabulate the member forces. CO6

2. Draw the Mohr circle and calculate the major principal stress, minor principal stress, maximum shear stress and also draw the planes of maximum shear stress for the Figure II as given below. CO5

3. A compound shaft consisting of a steel segment and an aluminum segment is acted upon by two torques as shown in Figure III below. Determine the maximum permissible value of T subject to the following conditions: Permissible shear stresses are τ_{st} = 100MPa, τ_{al} = 90MPa, and the angle of rotation of the free end is limited to 2.5°. For steel, G = 85 GPa and for aluminum, G = 32 GPa.For steel shaft dia=175mm and for aluminum shaft dia= 125mm. CO1

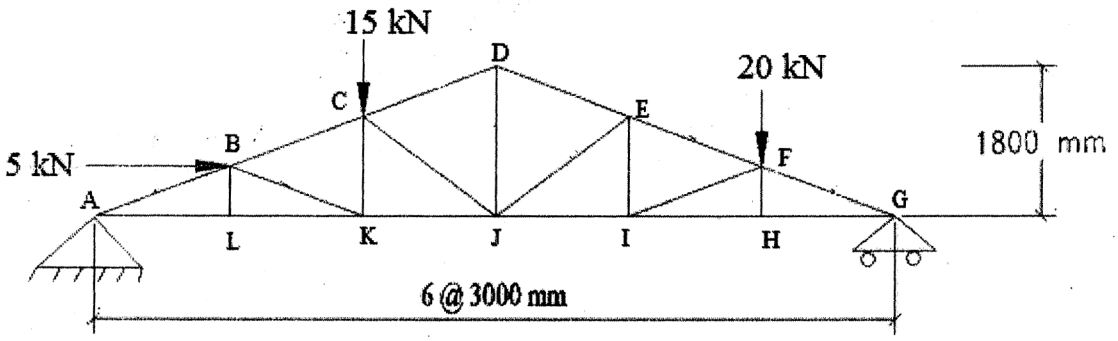


Figure -I

[Turn over

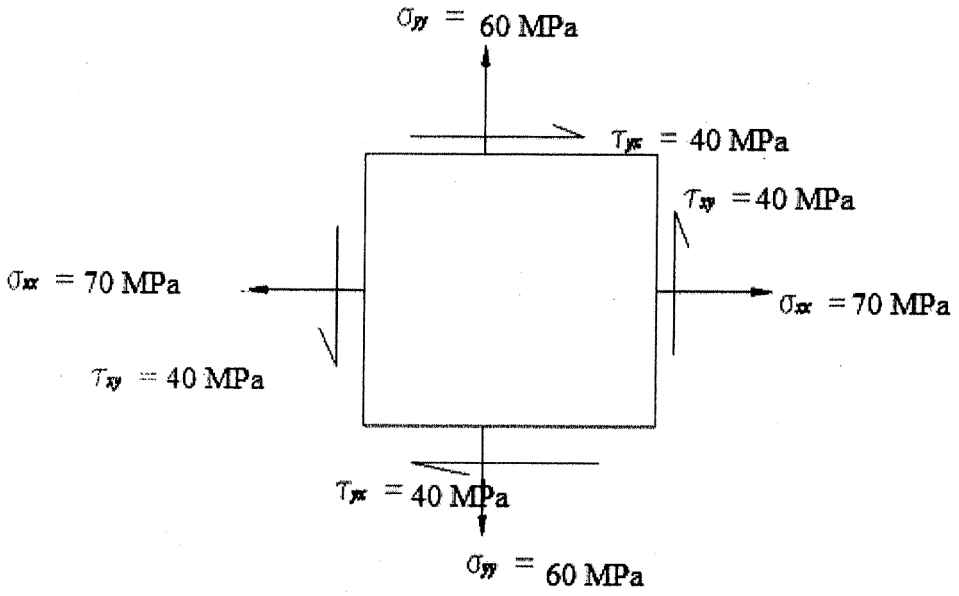


Figure -II

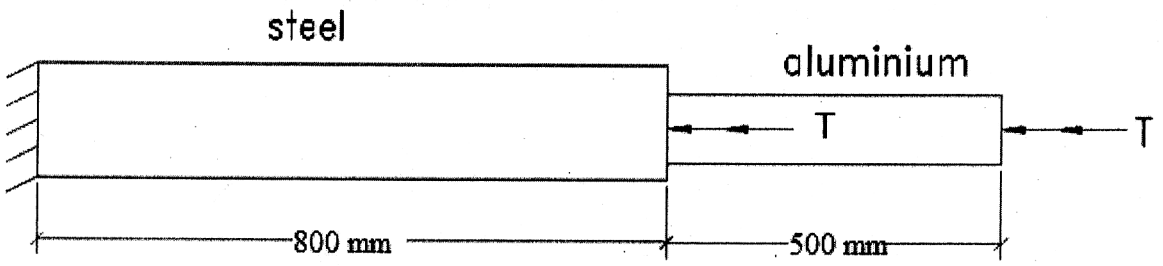


Figure -III

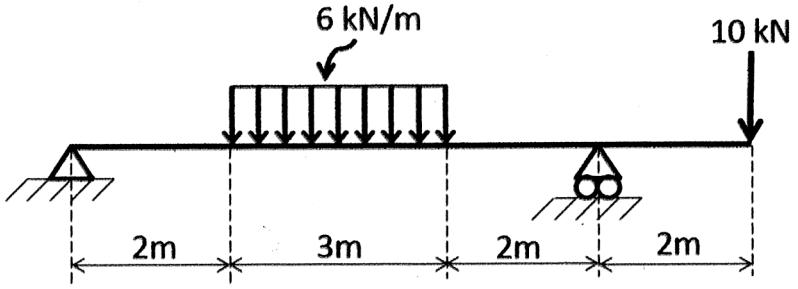
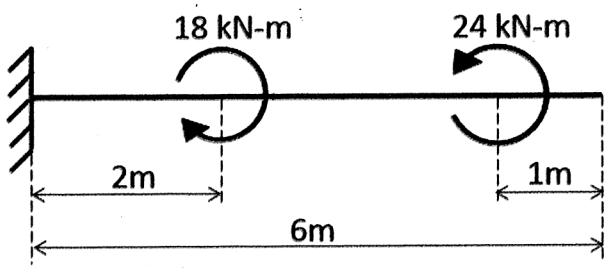
Ref. No. : Ex/CE/PC/B/T/214/2025

Name of the Examinations: B.E. CIVIL ENGINEERING SECOND YEAR FIRST SEMESTER - 2025

Subject : STRUCTURAL MECHANICS I

Time: 3 Hours (Total) | Part: II | Marks: 50 | Full Marks: 100

Instructions:	
I	Use Separate Answer scripts for each part.
II	All notations represent their standard relevant meaning.
III	If you feel that any data or condition is/are missing in any question, please assume relevant inputs and mention the same.

Sl No	**Question**	**Marks**	**CO**
1	(a) Derive the expression for axial extension of a prismatic bar under its self-weight. (8 Marks) (b) Consider a solid prismatic bar of length 0.5m and cross sectional of 2500 mm^2 made of homogeneous and isotropic material (Young's Modulus= $2x10^5$ N/mm^2; Coefficient of thermal expansion = $12x10^{-6}$ /^{0}C). The bar is fixed from both the ends and experiencing increase of temperature 25^{0}C from no thermal stress condition. Calculate the amount of thermal stress developed in the bar considering only linear direction. (7 marks) (c) Write a short note about the Compression failure and Tension Failure of Ductile and Brittle materials using neat sketches. (5 marks).	20	CO 1
2	Consider the beam from Figure: 01 and draw Shear Force Diagram and Bending Moment Diagram for the beam.  Figure: 01 (No Scale)	15	CO 3
3	Consider the beam from Figure: 02. The beam is prismatic having solid rectangular cross section of breadth 100mm and depth 200mm. Locate the point(s) with maximum Bending Moment and Draw bending stress distribution diagram for the point with maximum bending moment. Also Find out amount of bending stress at the same point at 50mm depth from the upper edge.  Figure: 02 (No Scale)	15	CO 4