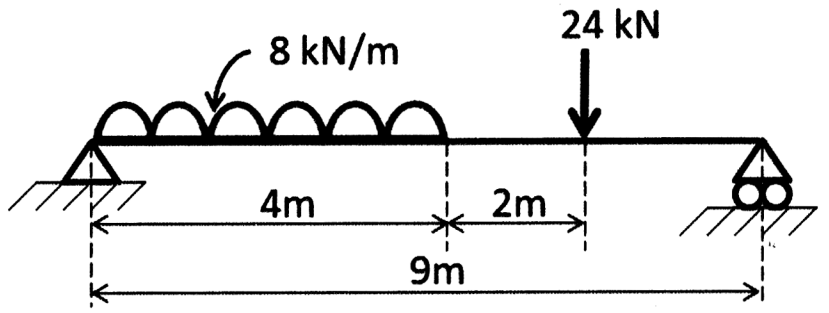
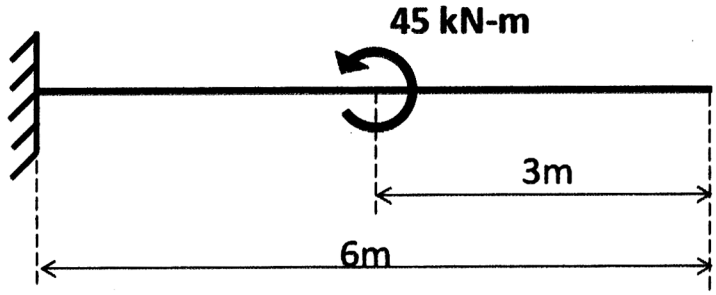
Ref. No. : Ex/CE/PC/B/T/214/2023(S)

Name of the Examinations: B.E. CIVIL ENGINEERING SECOND YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2023

Subject : STRUCTURAL MECHANICS I

Time: 3 Hours Part: I (50 Marks) 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	Derive the expression of thermal stress developed in a bar which is restricted from both end and is subjected to decrease in temperature. (6 marks) Briefly discuss the nature of stress strain curve of Elasto-plastic material, Perfectly plastic material and ideal rigid material with the help of diagrams. (9 marks) Write a short note on Proof Stress and its significance in Engineering applications. (5 Marks)	20	CO1
2	Consider the beam from Figure: 01 and draw Shear Force Diagram and Bending Moment Diagram for the beam.  Figure: 01 (Not to Scale)	15	CO3
3	Consider the prismatic beam from Figure: 02 of uniform beam cross section (Breadth 100mm and depth 200mm). Consider Young's Modulus, $E=2x10^5$ N/mm^2 for the entire beam. Draw the bending stress distribution diagram for the section with maximum bending moment of the beam.  Figure: 02 (Not to Scale)	15	CO4

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B.E. Civil Engineering ,Second Year ,First Semester Exam 2023

SUBJECT – Structural Mechanics I

Part - II

(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.Locate the shear center of the given channel section as shown in the Figure II below. CO4

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

4. A compound shaft consisting of a steel segment and an aluminum segment is acted upon by two torques as shown in Figure IV below. Determine the maximum permissible value of T subject to the following conditions: Permissible shear stresses are τ_{st} = 100MPa, τ_{al} = 85MPa, and the angle of rotation of the free end is limited to 3°. For steel, G = 83 GPa and for aluminum, G = 30 GPa. For steel shaft dia=150mm and for aluminum shaft dia= 100mm. CO1

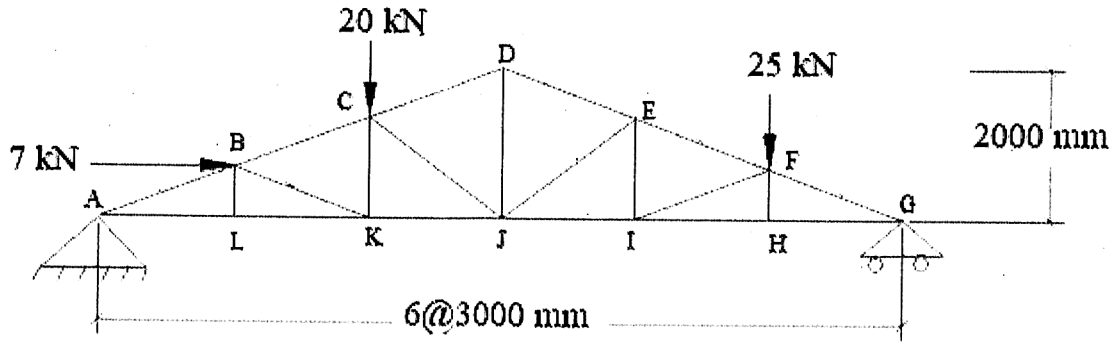

Figure -I

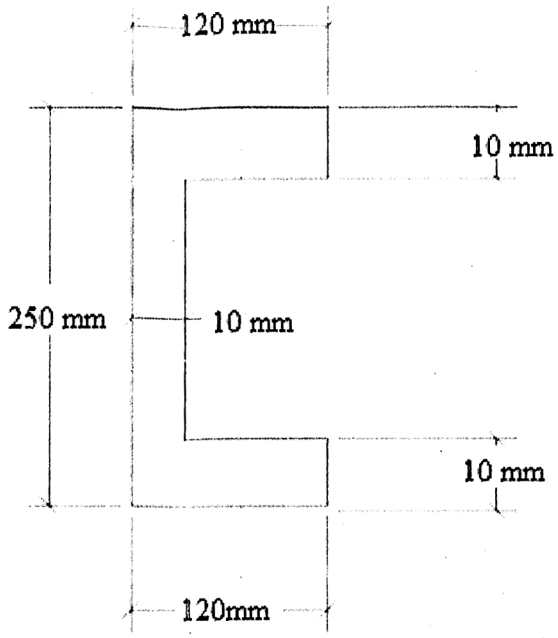

Figure -II

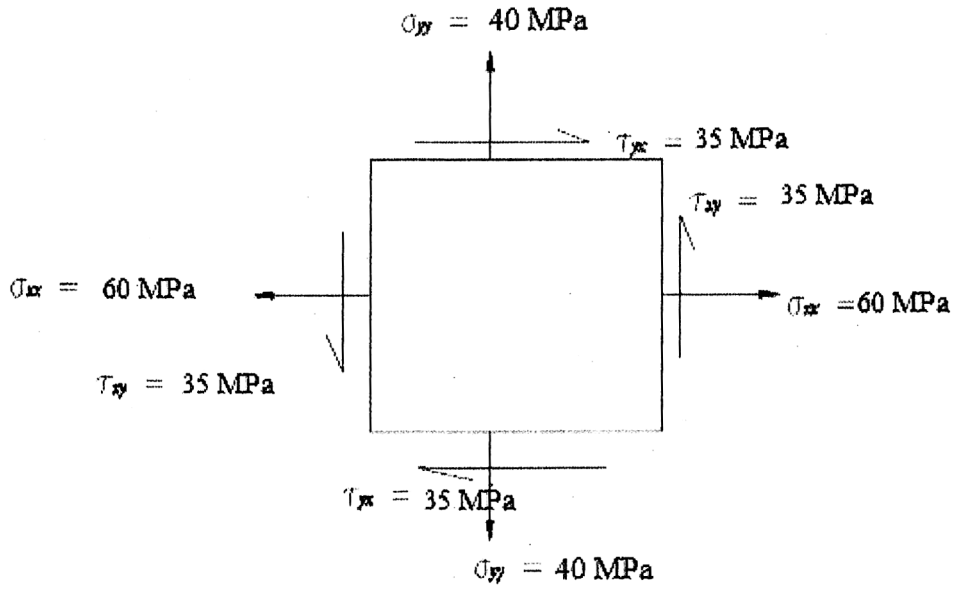

Figure –III

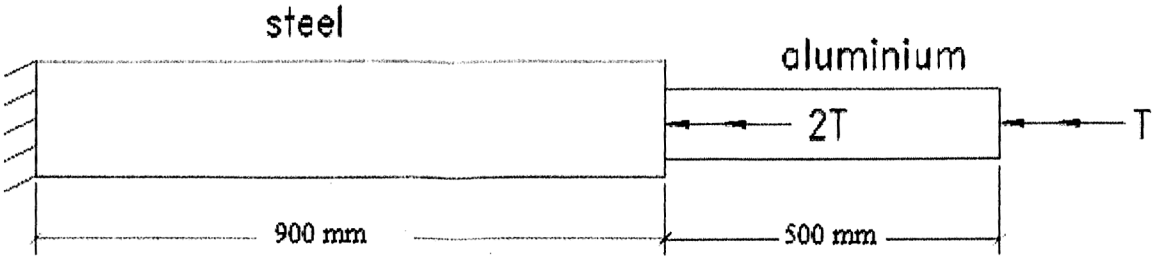

Figure –IV