

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

Subject : STRUCTURAL MECHANICS I

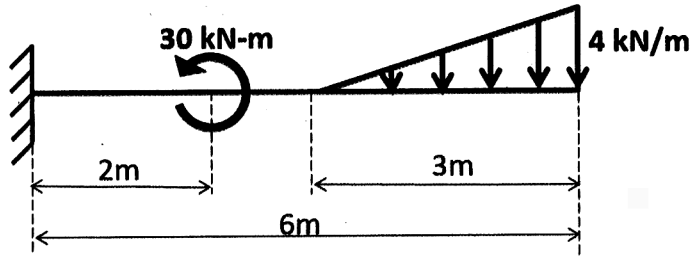
Time : Three hours

Full Marks : 100

((50 Marks for each Part)

PART I

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
1	Derive the expression for axial extension of a prismatic bar under its self-weight. (8 Marks) What is Modulus of Resilience and Modulus of Toughness? Explain with the help of any Engineering stress-strain curve of a ductile material under tension. (8 marks) Write a short note on Saint Venant's Principle. (4 marks).	20
2	Consider the beam from <u>Figure: 01</u> and draw Shear Force Diagram and Bending Moment Diagram for the beam.  <u>Figure: 01 (No Scale)</u>	15
3	A simply supported prismatic beam of length 4m is subjected to uniformly distributed load of 6 kN/m over its entire span. The beam is having rectangular cross section of breadth 100mm and depth 200mm. Draw bending stress distribution diagram for the mid-point of the beam. Also find out amount of bending stress at the same point at 50mm depth from the upper edge.	15

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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 $\tau_{st} = 100\text{MPa}$, $\tau_{al} = 85\text{MPa}$, and the angle of rotation of the free end is limited to 4° . For steel, $G = 83\text{ GPa}$ and for aluminum, $G = 28\text{ GPa}$. For steel shaft dia=150mm and for aluminum shaft dia= 100mm. CO1

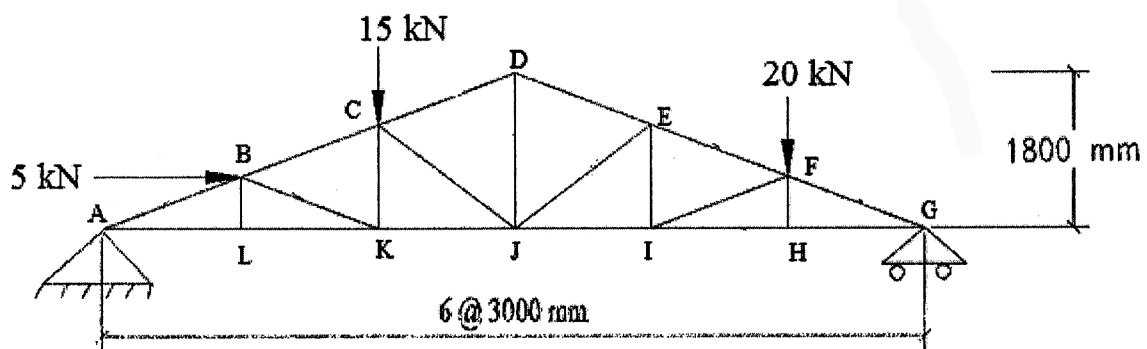


Figure -I

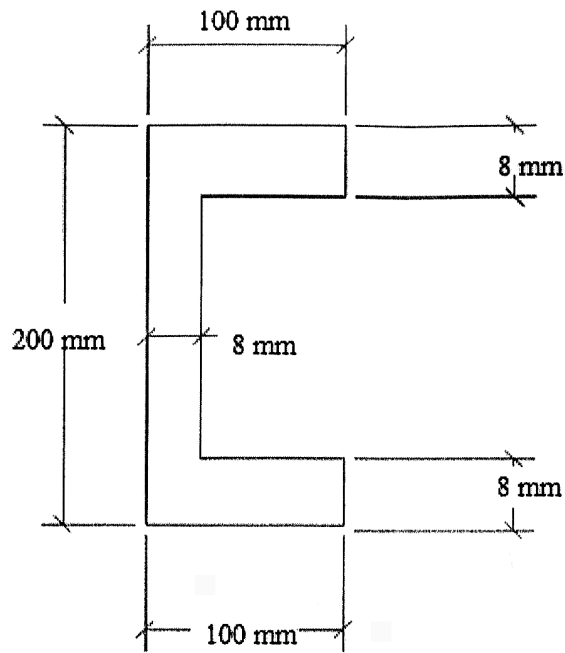


Figure -II

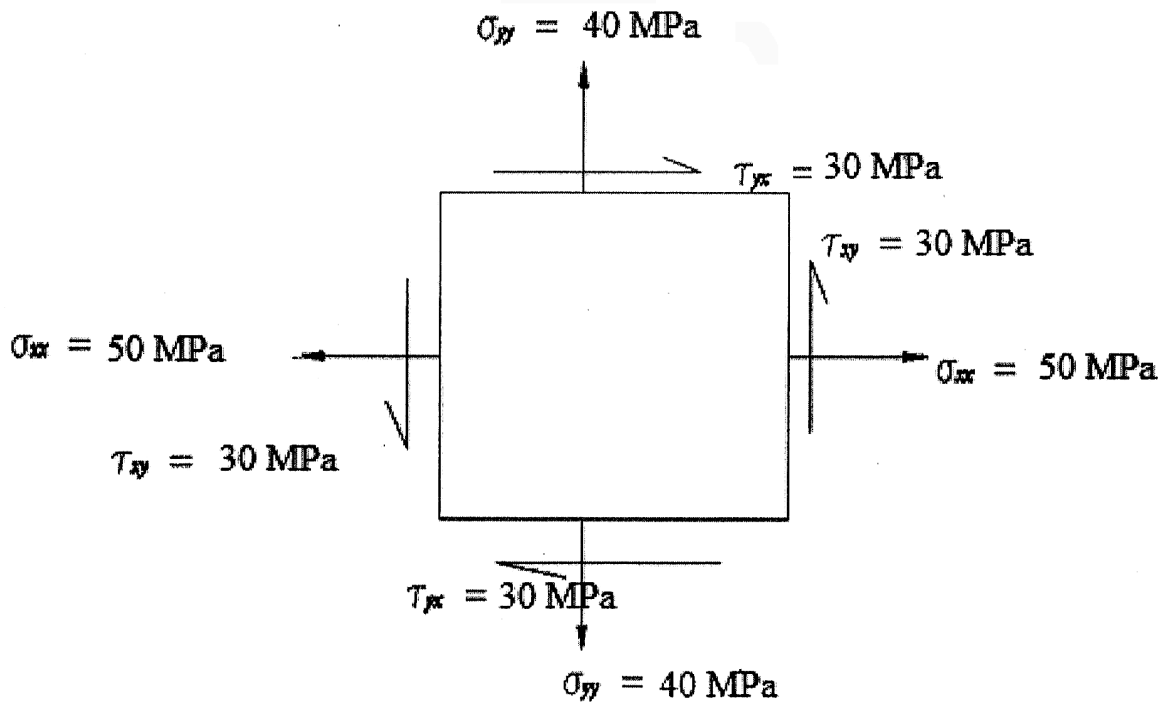


Figure -III

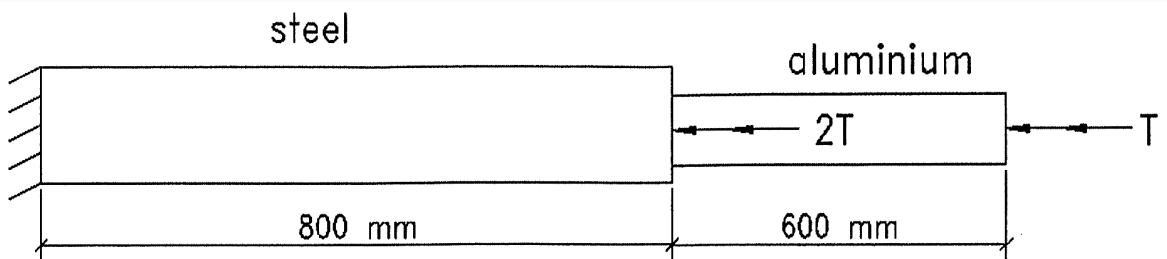


Figure -IV