

Please check that this question paper contains 2 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 3<sup>rd</sup>

Name of Subject: Strength of Materials

Subject Code: PCME-102

Paper ID: 16073

Scientific calculator is Allowed

MORNING

10 MAY 2023

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

**Part – A**

[Marks: 02 each]

Q1.

- a) What do you mean by principal stresses?
- b) Name types of stresses induced in thin cylinders.
- c) What are the limitations of Euler's formula?
- d) What are flitched beams?
- e) Define Poisson's ratio.
- f) What is the significance of Point of Contraflexure?

**Part – B**

[Marks: 04 each]

- Q2. Derive a Relation between E (Young's Modulus), C (Shear Modulus) and K (Bulk Modulus).
- Q3. A steam boiler of 800 mm diameter is made up of 10 mm thick plates. If the boiler is subjected to an internal pressure of 2.5 MPa, find the circumferential and longitudinal stresses induced in the boiler.
- Q4. Derive the bending equation  $M/I = f/y = E/R$  by mentioning suitable assumptions.
- Q5. A cantilever of length 2 m carries a udl of 1 KN/m run over a length of 1.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever.

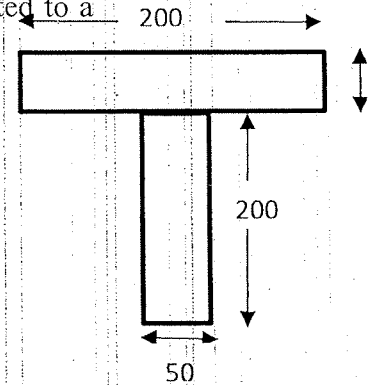
- Q6. Derive Euler's formula for column with one end fixed and other free.  
 Q7. Explain Polar Moment of Inertia and where is it used?

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Part – C

[Marks: 12 each]

- Q8. A T-shaped cross section of a beam as shown in figure is subjected to a vertical shear force of 100 kN. Calculate the shear stress at important points and draw shear stress distribution diagram. Moment of inertia about the horizontal neutral axis is  $113.4 \times 10^6 \text{ mm}^4$ .



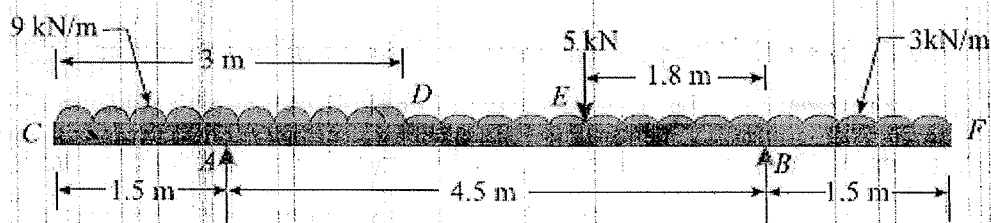
OR

The stresses at a point on machine component are 150 MPa and 50 MPa both tensile. Draw Mohr's circle to find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of  $55^\circ$  with the axis of major tensile stress. Also find the magnitude of maximum shear stresses induced.

- Q9. Describe the Macaulay's method for calculating slope and deflection of a simply supported beam with a central point load.

OR

Draw the shear force and bending moment diagram for the beam which is loaded as shown in figure below. Also determine the point of contraflexure within the span CF.



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