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RN-6127

B. E. - II (Sem. III) (Chemical) Examination

May / June - 2010

Strength of Materials - I

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दर्शाविए निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. - 2 (Sem. 3) (Chemical)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Strength of Materials - 1"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="7"/>	Section No. (1, 2,.....) : <input type="text" value="1&2"/>
	<input type="text" value="Student's Signature"/>

- (2) Answers to the **two** sections must be written in **separate** answer books.
- (3) Figures to the right indicate full marks.
- (4) Assume any additional data if required and mention them clearly.
- (5) Justify your answers with suitable diagrams.

SECTION - I

- 1 (a) Fill in the blanks : 5
- (i) The diagram which represents the variation of shear force throughout the length of beam is termed as _____.
 - (ii) Resistance to impact is called as _____.
 - (iii) The ductility of C.I. is _____ than that of steel.
 - (iv) Poisson's ratio is the ratio of _____ strain to linear strain.
 - (v) Relation between Young's modulus and bulk modulus is given by _____.

(b) Match the following : 5

Name of M/c.	Type of Test perform
(i) U.T.M.	(a) Hardness
(ii) Torsion	(b) Endurance limit
(iii) B.H.N. – V.H.N.	(c) Modulus of rupture
(iv) Carpy impact	(d) Rigidity
(v) Fatigue	(e) Toughness

(c) Define the following : (any two) 6

- | | |
|----------------------------|-----------------|
| (1) Strength | (2) Brittleness |
| (3) Point of contraflexure | (4) Hardness. |

2 Draw S.F.D. and B.M.D. for the beam as shown in figure no. 1. Also find the point of contraflexure if any. 14

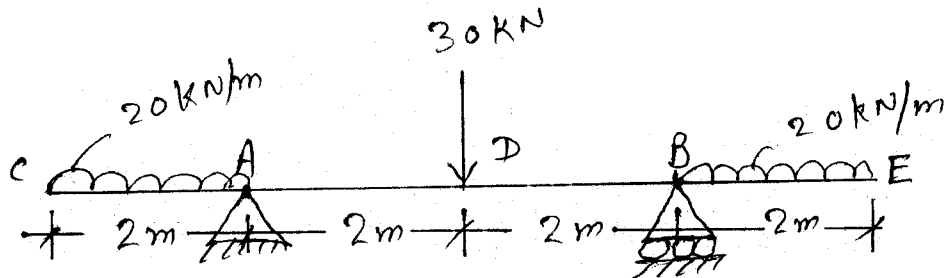


Fig. 1

3 Attempt any two : 20

- (i) A steel shaft transmits 105 kW at 160 r.p.m. If the shaft is 100 mm in diameter, find the torque required and maximum shearing stress induced. Find also the twist of the shaft in a length of 6 m. Take $c = 8 \times 10^4 \text{ N/mm}^2$.
- (ii) Find the elongation of the bar as shown in figure no.2. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

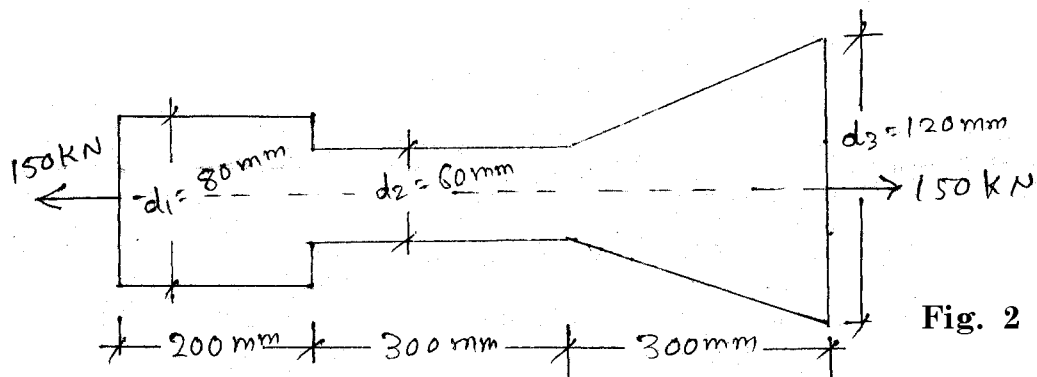


Fig. 2

- (iii) Derive the equation for the deformation of uniformity tapering bar subjected to axial force P.
- (iv) Derive the equation for volumetric strain of a rectangular bar, subjected to three mutually perpendicular forces.

SECTION - II

- 4 (a) Match the following : 5
- | Failure Pattern | Name of test |
|-------------------------|-------------------|
| (i) Cut into two pieces | (a) Compression |
| (ii) Flat surface | (b) Torsion |
| (iii) Cup and Cone | (c) Tension |
| (iv) Twisted Fibre | (d) Charpy Impact |
| (v) Bulging-Buckling | (e) Fatigue |
- (b) Fill in the blanks : 5
- (i) At Neutral axis value of bending stress is _____.
 - (ii) Stiffness of the spring can be defined as a ratio of _____.
 - (iii) The equation of torsional strength is _____.
 - (iv) S.N. diagram is plotted in _____ test.
 - (v) In simply supported beam maximum bending moment occurs at _____.

- 5 Attempt any two : 18
- (i) A hollow cylindrical C.I. column is 4 m long with both end hinged. Determine inside and outside diameter of column if it is subjected to an axial load of 300 kN. Use Rankine's formula.
(Inside dia. = $0.8 \times$ outside dia), $f_c = 550 \text{ N/mm}^2$,
 $\alpha = 1/1600$.
 - (ii) At a point in a strained material, the principal stresses are 100 N/mm^2 tensile and 40 N/mm^2 compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principal stress. Also determine maximum intensity of shear stress in the material. (figure 3)

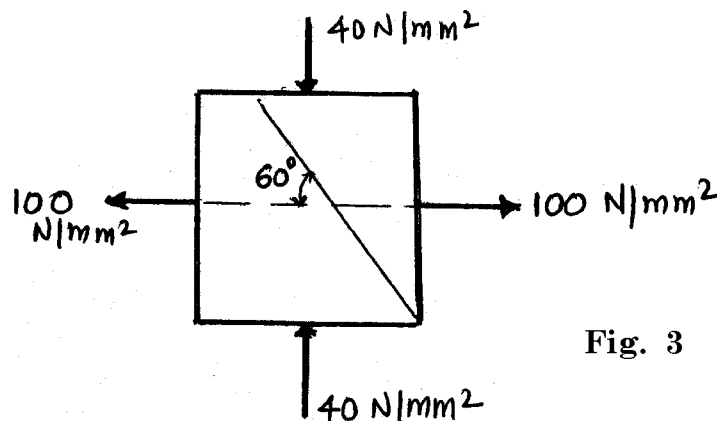


Fig. 3

(iii) Explain following :

- (a) Sketch the shear stress variation across the rectangle, I and T beam.
- (b) Equation of Torsional strength with all notations.
- (c) Toughness and Hardness.

- 6 (a) A T shaped beam shown in figure 4. If a bending moment of 3400 N.m. is applied around the horizontal neutral axis. Determine the bending stresses at top and bottom fibre of the beam. Nature of bending moment is sagging also plot bending stress distribution diagram. 11

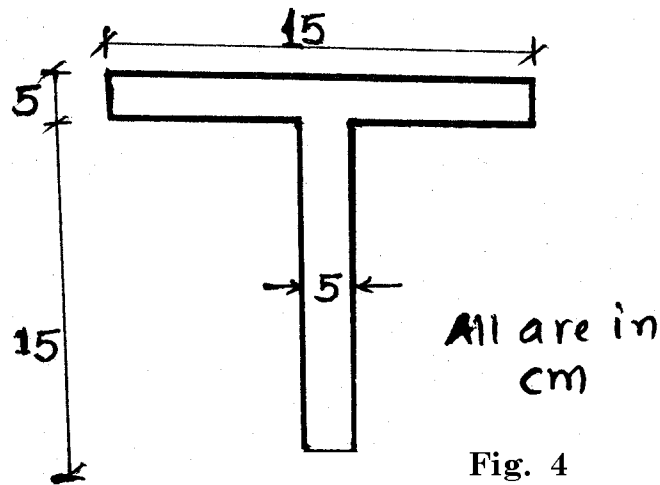


Fig. 4

- (b) A beam is supported at its two ends and induce 200 kN shear force. The cross section of the beam is shown in figure 5. Plot the shear stress distribution diagram at various point of the section. Moment of inertia (I) = $2953 \times 10^8 \text{ mm}^4$.

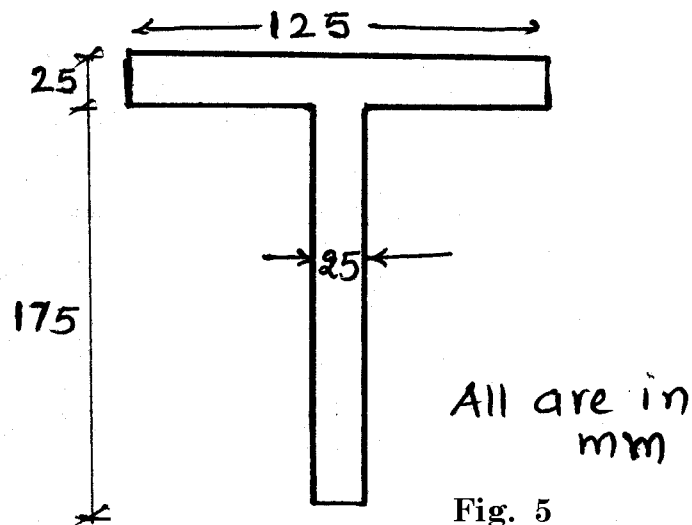


Fig. 5