



UF-6127

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

May / June - 2012

Strength of Materials - I

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दृष्टावेक 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) (MECH.)"/>	<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"/>	<input type="text" value="Student's Signature"/>
Section No. (1, 2,...): <input type="text" value="Nil"/>	

- (2) Answer to the two sections must be written in separate answer book.
- (3) Make suitable assumptions wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) All dimensions are in mm wherever required.

- 1 (a) Fill in the blanks : 5
- (i) Lateral strains are _____ longitudinal strains.
(Always less than, Sometimes less than never less than)
- (ii) Bending Moment is _____ at a hinged support.
(Always maximum, always zero)
- (iii) Poisson's ratio is ratio of _____
(longitudinal to lateral strain, lateral to longitudinal strain, shear stress to shear strain)
- (iv) At the pont of contraflexure _____ changes its sign.
(shear force, bending moment, axial force)
- (v) Shear stress on principal plane is _____
(maximum, zero, minimum)

(b) Match the following :

5

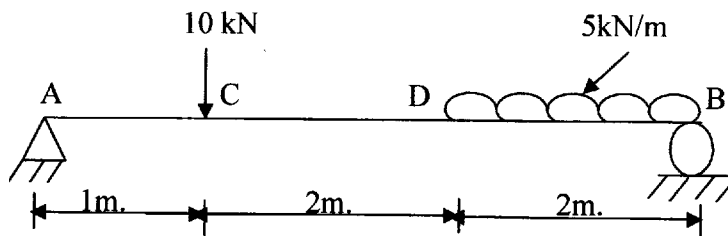
- | ‘A’ | ‘B’ |
|---------------------------------|--------------|
| (i) Toughness | (a) Impact |
| (ii) Rigidity | (b) Fatigue |
| (iii) Resistance to penetration | (c) Hardness |
| (iv) Endurance limit | (d) Torsion |
| (v) Ductility | (e) Tension |

(c) State whether the statement is True or False :

6

- (i) For any section shear stress at the top edge is maximum.
- (ii) The point of contraflexure is a point where B.M. changes the sign.
- (iii) Every material obeys hook's law within plastic limit.
- (iv) The ratio of lateral strain to the linear strain is called Poisson's ratio.
- (v) On a principal plane the magnitude of shear stress will be equal to maximum.
- (vi) Strength of beam mainly depends upon section modulus.

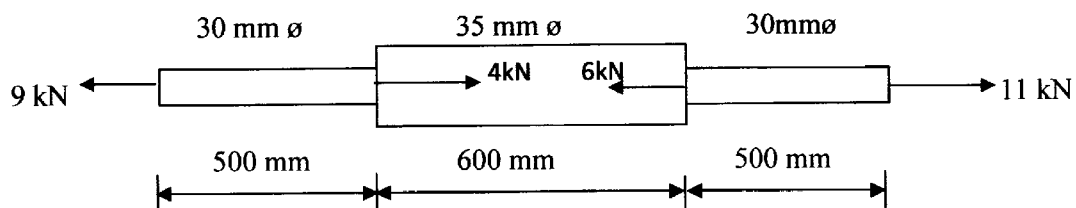
2 Draw S.F.D. and B.M.D. for the beam as shown in figure. 14



3 Attempt any two :

20

- (i) Derive the formula for the elongation of a tapered circular bar under the action of axial load.
- (ii) A steel bar 1600 mm long is acted upon by forces as shown in fig. below. Find the elongation of the bar. Take $E = 210 \text{ GN/m}^2$.



- (iii) Derive relation between three modulus E, G, and K with usual notations.
- (iv) A simply supported beam, rectangular in section 300 mm deep has span of 4m. If bending stress is not exceed 120 N/mm^2 , and $I = 8 \times 10^6 \text{ mm}^4$, find the U.D.L. per meter, which the beam can carry.

4 Fill in the balnks : 10

- (i) M.S. is a _____ material. (ductile/brittle)
- (ii) Bending stress developed at ultimate load is called _____ (Modulus of rupture/modulus of elasticity)
- (iii) Charpy Impact test is used to find out stiffness of material (True/False)
- (iv) Equation of Torsion _____.
- (v) Equation of bending _____.
- (vi) Resistance offered by the material against indentation is called _____ (Toughness/Hardness)
- (vii) Compression test failure for short column is _____ failure. (Buckling/Bulging)
- (viii) Point of confra flexure is a point where shear force is zero. (True/False)
- (ix) Euler's formula is for long column. (True/false)
- (x) Ratio of effective length of a column to minimum radius of gyration is called slenderness ratio. (True/False)

5 (a) Determine the bending stresses in a beam of T-section 12 (figure 1) having sagging bending moment of 4 kN-m. Also plot the bending stress distribution curve.

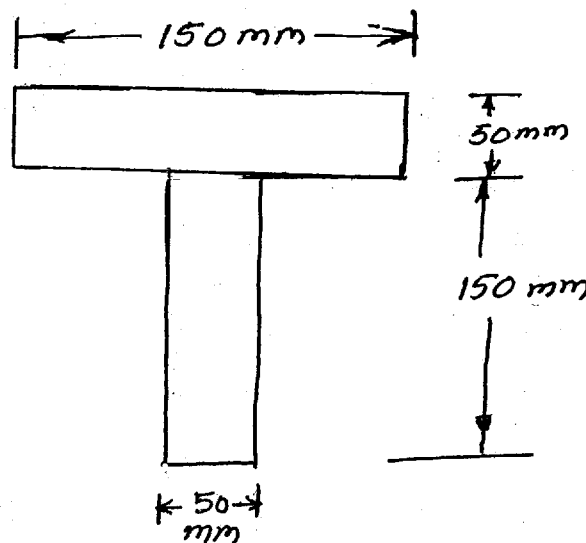


Fig. 1

- (b) A simply supported beam is made up of an I-section having flange section 200×20 mm and web section $10 \text{ mm} \times 300$ mm. The section carries a shear force of 120 kN. Determine maximum shear stress value and draw shear stress distribution diagram. **10**

6 Attempt any two only : **18**

- (i) Derive Euler's expression for buckling load of a column with both the ends hinged.
- (ii) A material is under pure shear of intensity of 50 N/mm^2 . Find principal stresses and location of principal planes.
- (iii) A hollow C.I. column, whose outside diameter is 200 mm has a thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate slenderness ratio and ratio of Euler's Rankine's critical loads.

$$f_c = 550 \text{ N/mm}^2,$$

$$\alpha = \frac{1}{1600}$$

$$E = 9.4 \times 10^4 \text{ N/mm}^2.$$

