B.E.(Civil Engineering) Semester Third (C.B.S.)

Strength of Materials

P. Pages : 3 **KNT/KW/16/7208**

Time : Three Hours * 0 8 9 8 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Draw stress strain curve for mild steel under tension and explain the salient points. **6**

b) A thin cylindrical shell 1 m in diameter and 3 m long has a metal thickness 10 mm. It is subjected to an internal fluid pressure of 3 MPa. Find the circumferential and longitudinal stresses in the wall. Also Determine the changes in length, diameter and volume of the cylinder. Take E = 210 GPa and = μ 0.3. **7**

OR

2. a) Derive the equation relating E, G and μ. **6**

b) A composite section madeup of copper rod 150 mm diameter enclosed in steel tube of 150 mm internal diamater and 10 mm thickness. Length of the assembly is 500 mm and fastened at both the ends. If the temperature of the is raised to 60ºC, find the stresses developed in each material. **7**

$Es = 2 x 10^5 N/mm^2$; $Ec = 1.05 x 10^5 N/mm^2$

$\alpha S = 12X10^{-6}/^oC$; $\alpha c = 17.5 x 10^{-6}/^oC$

3. Draw SFD and BMD for the loaded beam shown in Fig. 1 and also find the point of contra flexure if any. **13**

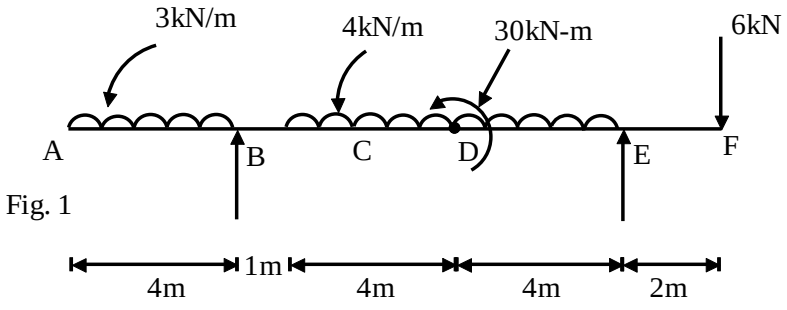

Fig. 1

4. Draw SFD and BMD for the loaded beam shown in Fig. 2 and also find the point of contra flexure if any. **13**

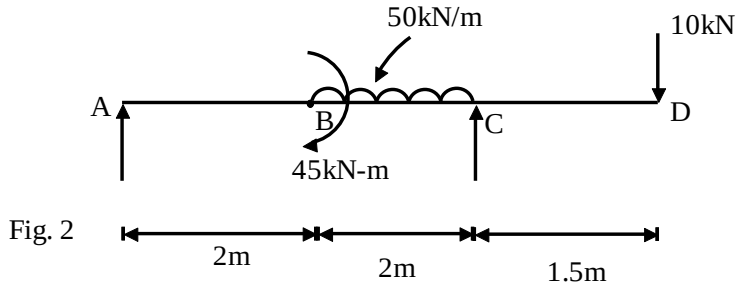

Fig. 2

5. a) Derive with suitable assumptions flexure formula. **7**

b) A simply supported beam of length 4 m carrying a UDL of 20 kN/m over it entire span. The beam is of I section with following data. Top flange 60 mm x 10 mm; web 10 mm x 100 mm and bottom flange 120 mm x 10 mm. Calculate bending stresses and draw the distribution diagram. **7**

OR

6. a) Find the dimension of the strongest beam that can be cut from the cylindrical log of wood with diameter 'D'. **6**

b) Prove in circular section the maximum shear stress intensity is equal to $\left(\frac{4}{3}\right)$ of average shear stress. **8**

7. a) A solid circular shaft is to transmit 300 kW at 100 rpm. If the shear stress in not to exceed 80 N/mm^2. find the diameter of the shaft. What % of saving in weight would be obtained if this shaft is replaced with hollow one whose internal diameter is 0.6 times of external diameter? The length, material and maximum shear stress being same. **13**

OR

8. Two solid shafts AC and BC of aluminum and steel are rigidly connected at 'C' and attached to rigid supports at A and B. Shaft AC is 75 mm in diameter and having length 2m. Shaft BC is 55 mm diameter and having length 1m. A torque of 200 Nm was applied at junction 'C'. Compute the maximum shearing stress in each material. What is the angle of twist at the junction? **13**

$G_{al} = 3x10^4\,N/mm^2$ and $G_{st} = 9x10^4\,N/mm^2$.

9. For the beam shown in Fig. 3, Calculate slope at point A, E and F. Also calculate deflection at point B and maximum deflection. **13**

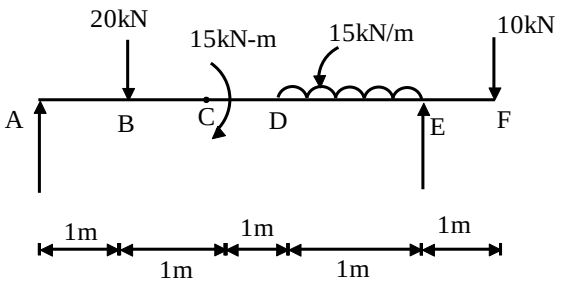

Fig:3

OR

10. For the beam shown in Fig. 4, Calculate slope at A and D. Also calculate deflection at B, C and maximum deflection. **13**

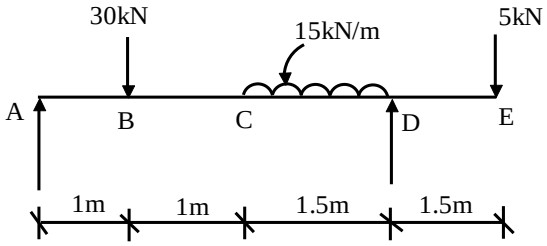

Fig:4

11. a) A circle of 400 mm diameter is scribed on a mild steel plate before it is subjected to stresses as shown in Fig. 5. Calculate the lengths of major and minor axis of the ellipse and also find their direction $\mu = 0.3; E = 205\ kN/mm^2$. **8**

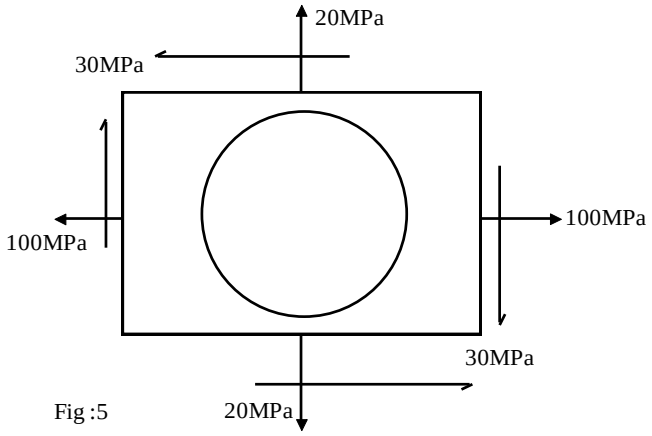

Fig :5

b) Principal stresses at a point in a material are p_1 and p_2 respectively. Calculate the resultant stress on the plane carrying maximum shear stress. **6**

OR

12. For the stressed element as shown in Fig. 6 find the following. **14**

i) Normal and tangential stresses on the inclined plane making 30º clockwise with X axis.

ii) Principal stresses and principal planes location.

iii) Maximum shear stress and its location.

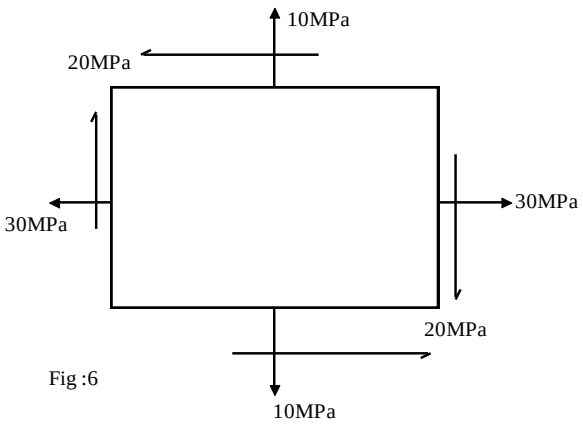

Fig :6

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