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

Theory of Structures

P. Pages : 3 **NRT/KS/19/3947**

Time : Three Hours * 0 2 2 1 * 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. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.
11. IS 456 – 2000 is permitted.

1. a) With the help of stress – strain curve for mild steel. Explain the following terms **5**

i) Limit of Proportionality. ii) Yield Point.

iii) Ultimate Stress. iv) Breaking Point.

b) A composite section made up of copper rod 200 mm diameter enclosed in steel tube of 150 mm internal diameter and 12 mm thick. length of assembly is 600 mm and fastened at both the ends. If temperature of rod is raised to 60°C. Find the stresses developed in each material. Take **8**

$E_S = 2\times10^5\ N/mm^2$ $E_C = 1.05\times10^5\ N/mm^2$

$\alpha_S = 12\times10^{-6}/°C$ $\alpha_C = 17.5\times10^{-6}/°C$

OR

2. A point in strained material is subjected to stress as shown in fig. 1 **13**

find

i) Principal Stress & its position.

ii) Maximum shear stress and its position.

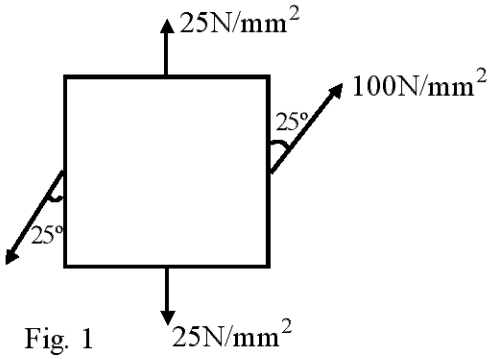

Fig. 1

3. Draw shear force and bending moment diagram for the beam shown in fig. 2 locate the point of contraflexure if any **13**

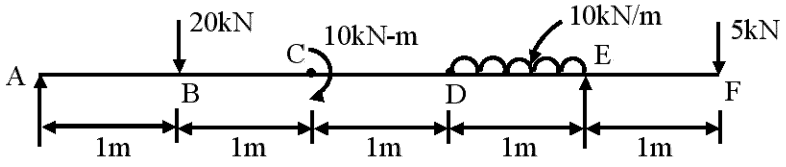

Fig. 2

OR

4. Draw shear force & bending moment diagram for the beam shown in fig. 3? Define point of contra – flexure. **13**

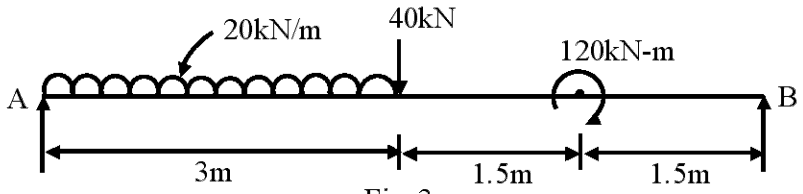

Fig. 3

5. a) 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 $60\,mm \times 10\,mm$; web $10\,mm \times 100\,mm$ and bottom flange $120\,mm \times 10\,mm$. Calculate bending stresses and draw the distribution diagram. **7**

b) Explain Assumption in **7**
i) The theory of pure torsion
ii) The theory of simple bending

OR

6. a) In a close coiled helical spring the dia of each coil is to be 10 times that of wire of the spring and the maximum shear stress is not to exceed $60\,N/mm^2$. Maximum permissible deflection under a load of 400 N is 10 cm taking the shear modulus as $9 \times 10^4\,N/mm^2$, determine the number of coils, the diameter of the coil and energy stored in the coil. **9**

b) Draw a typical shear stress distribution over following beam section subjected to a shear force **5**
i) T – beam ii) I – beam

7. A beam AB of span 9 m carries a point load 100 kN at a section C, 6 m from A. Find the slope at A, the deflection under the load and also the maximum deflection by conjugate beam method. Take $E = 200\,kN/mm^2$ & $I = 1.25 \times 10^9\,mm^4$. **13**

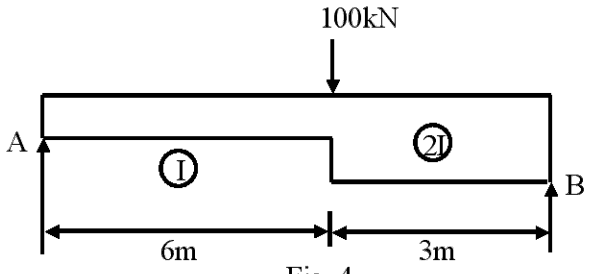

Fig. 4

OR

8. Analysis the continuous beam ABCD as shown in fig. 5 ? Plot BMD using three moment equation. **13**

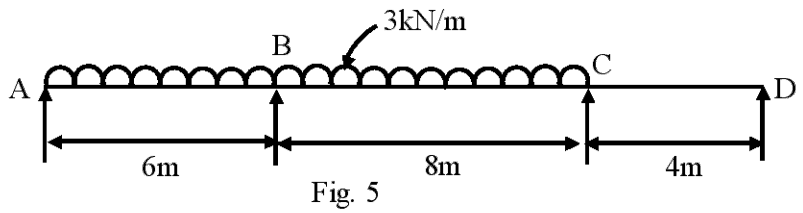

Fig. 5

9. Find the support moments for the continuous beam shown in fig. 6 by moment distribution method. **14**

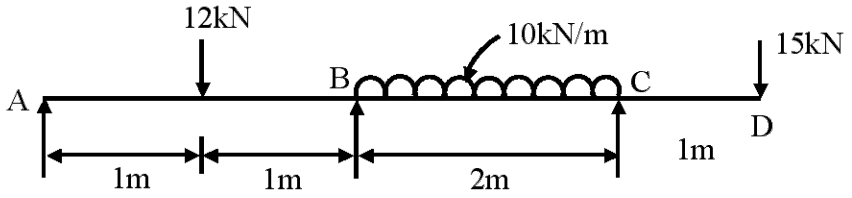

Fig. 6

OR

10. Using the moment distribution method, draw the bending moment diagram of the portal frame as shown in fig. 7. **14**

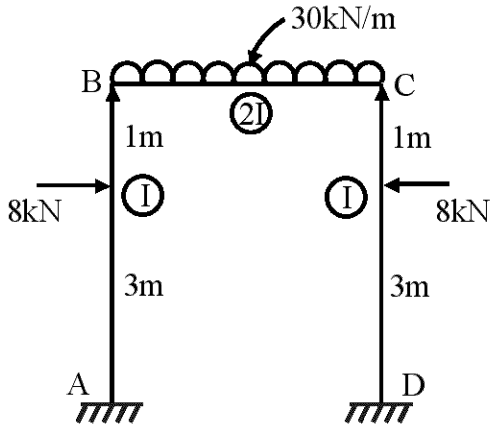

Fig. 7

11. Design a 'T' Beam for following data. **13**

a) Effective Span 4.5 m.
b) Spacing of beam 3.0 m centre to centre
c) Thickness of slab – 100 mm
d) Width of web – 230 mm
e) Live load $8\,kN/m^2$
f) Floor finish load $0.5\,kN/m^2$
g) The beam also supports a partition wall which transmits a load of 7.5 kN/m.
Use M20 & Fe500. Use limit state design method.

OR

12. Design a one way slab for a room $3m \times 6.2m$ for the following data. Live load on the slab $= 2.5\,kN/m^2$. Floor finish on the slab $= 1.0\,kN/m^2$. Use M20 concrete and Fe 415 steel. Draw the neat reinforcement sketch. **13**

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