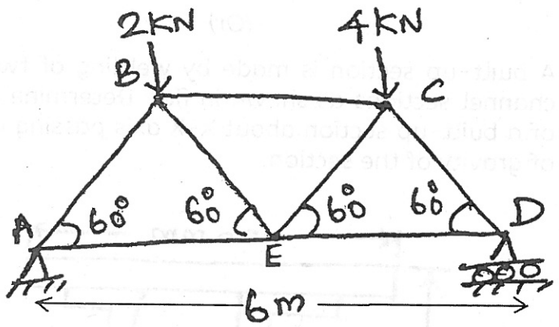
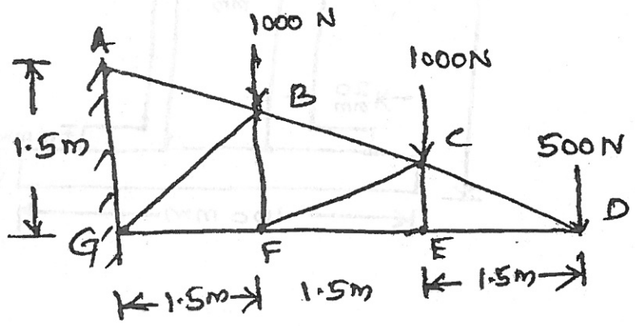
21. (a) Find the forces in all the members of the girder shown in fig. by method of joints.



(Or)

(b) A cantilever truss is shown in fig. Find the forces in all the members of the truss by graphical method and indicate whether forces are in tension or compression.



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788 Register No.:

October 2018

Time – Three hours
(Maximum Marks: 75)

[N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.]

PART – A

1. Define Poisson's ratio and its relationship with E and K.
2. What is modular ratio and equivalent area?
3. What is point of contraflexure and where the maximum BM occurs?
4. Define polar moment of inertia and polar modulus.
5. Write down the expression for strength equation and the significance of section modulus.
6. What is torsional modulus and its value for solid circular section of diameter 'd'?
7. How the perfect frame will be formulated?
8. Write down the expression for the relationship between intensity of load, SF and BM.

PART – B

9. A steel plate has modulus of elasticity as 200 GPa and Poisson's ratio 0.3. What is the value of bulk modulus for the steel plate.
10. A cantilever beam 2 m long carries a point load of 1.8 kN at its free end. Determine the maximum bending moment and shear force for the cantilever beam.
11. Locate the centroid for a trapezoidal section and write down the expression for it.
12. Derive the expression for a section modulus of a rectangular section.
13. Derive the expression for polar moment of inertia of a circular section of diameter 'd'.

[Turn over.....

14. A solid shaft is to transmit a torque of 10 kNm. If the shearing stress is not to exceed 45 MPa, find the minimum diameter of the shaft.

15. Write down three principles to identify the members which does not carry any forces in a determinate truss.

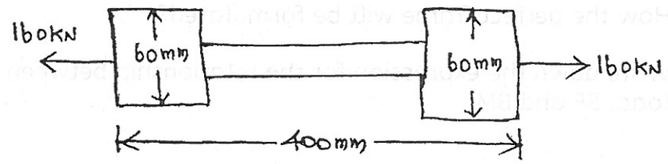
16. A rectangular beam 60 mm wide and 150 mm deep is supported over a span of 6 m. If the beam is subjected to a central point load of 12 kN, find the maximum bending stress induced in the beam section.

PART – C

17. (a) A solid bar 50 mm wide, 12 mm thick and 300 mm long is subjected to an axial pull of 84 kN. Find the changes in the length, width, thickness and the volume of the bar. Take $E=2\times10^5$ N/mm^2 and Poisson's ratio = 0.32.

(Or)

(b) Determine the diameter of the middle portion of bar shown in fig. subjected to a tensile load of 160 kN. The stress in the middle portion is limited to 150 N/mm^2. Find also the length of the middle portion, if the total elongation of the bar is to be 0.2 mm. Take $E=2\times10^5$ N/mm^2.



18. (a) A cantilever beam of 10 m span carries a uniformly distributed load of 3 kN/m over a length of 6 m and a point load of 4 kN at its free end. Draw the SF and BM diagrams for the cantilever beam.

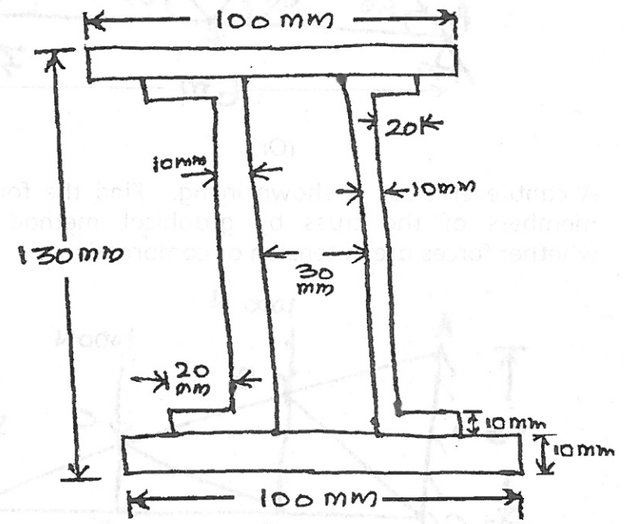
(Or)

(b) A simply supported beam 6m long is carrying uniformly distributed load of 5 kN/m over a length of 3m from the right end and 5 kN at a distance 1 m from left end. Draw the SF and BM diagrams for the beam and also calculate the maximum BM on the section.

19. (a) (i) Find the centre of gravity of a 100mmX150mmX30mm T-section.
(ii) Find the centre of gravity of a channel section of 100mm(web)X50mmX15mm.

(Or)

(b) A built-up section is made by welding of two plates and two channel sections as shown in fig. Determine moment of inertia of a built-up section about X-X axis passing through the centre of gravity of the section.



20. (a) The moment of inertia of beam section 500mm deep is 69.47×10^7mm^4. Find the longest span over which a beam of this section, when simply supported, could carry a uniformly distributed load of 50 kN per metre run. The flange stress in the material is not to exceed 110 N/mm^2.

(Or)

(b) A solid shaft has to transmit 100 kW at 160 rpm. Taking allowable stress as 70 MPa, Find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds the mean by 20%.

[Turn over.....