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3016

Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, April 2015
(2013 Scheme)
13.304 : MECHANICS OF SOLIDS
(MNPSU)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** question. **Each** question carries **4** marks.

1. Explain Mohr's circle with suitable sketches.
2. Explain Saint Venant's Principle
3. Define volumetric strain
4. What are the assumptions in the theory of simple bending ?
5. Explain Lame's equation.

PART – B

Answer **one full** question from **each module**. **Each** question carries **20** marks.

MODULE – I

6. A) Find the minimum diameter of a steel wire, which is used to raise a load of 4000 N if the stress in the rod is not to exceed 95 MN/m^2. **5**

   B) An axial pull of 40 kN is acting on a bar consisting of three sections of length 30 cm, 25 cm and 20 cm and of diameters 2 cm, 4 cm and 5 cm respectively. If E = 2x10^5 N/mm^2, determine **15**
   i) Stress in each section
   ii) Total extension of the bar.

7. A steel rod 5 cm diameter and 6 m long is connected to two grips and the rod is maintained at a temperature of 100°C. Determine the stress and pull exerted when the temperature falls to 20°C if
   i) The ends do not yield and
   ii) The ends yield by 0.15 cm. Take E = 2x10^5 N/mm^2 and $\alpha = 12 \times 10^{\wedge} - 6/°C$.

MODULE – II

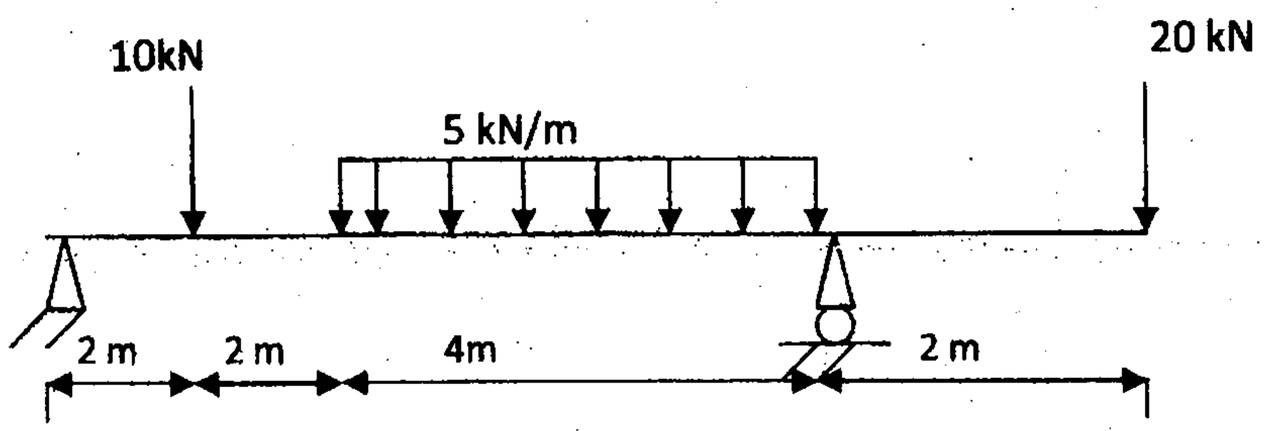
8. A metallic bar 250 mm x 80 mm x 30 mm is subjected to a force of 20 kN(tensile), 30 kN(tensile) and 15 kN(tensile) along the x,y and z directions respectively. Determine the change in the volume of the block. Take E = 2×10^5 N/mm^2 and Poisson's ratio = 0.25.

9. The stresses at a point in a bar are 200 N/mm^2(tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major stress. Also determine the maximum intensity of shear stress in the material at the point.

P.T.O.

MODULE – III

10.

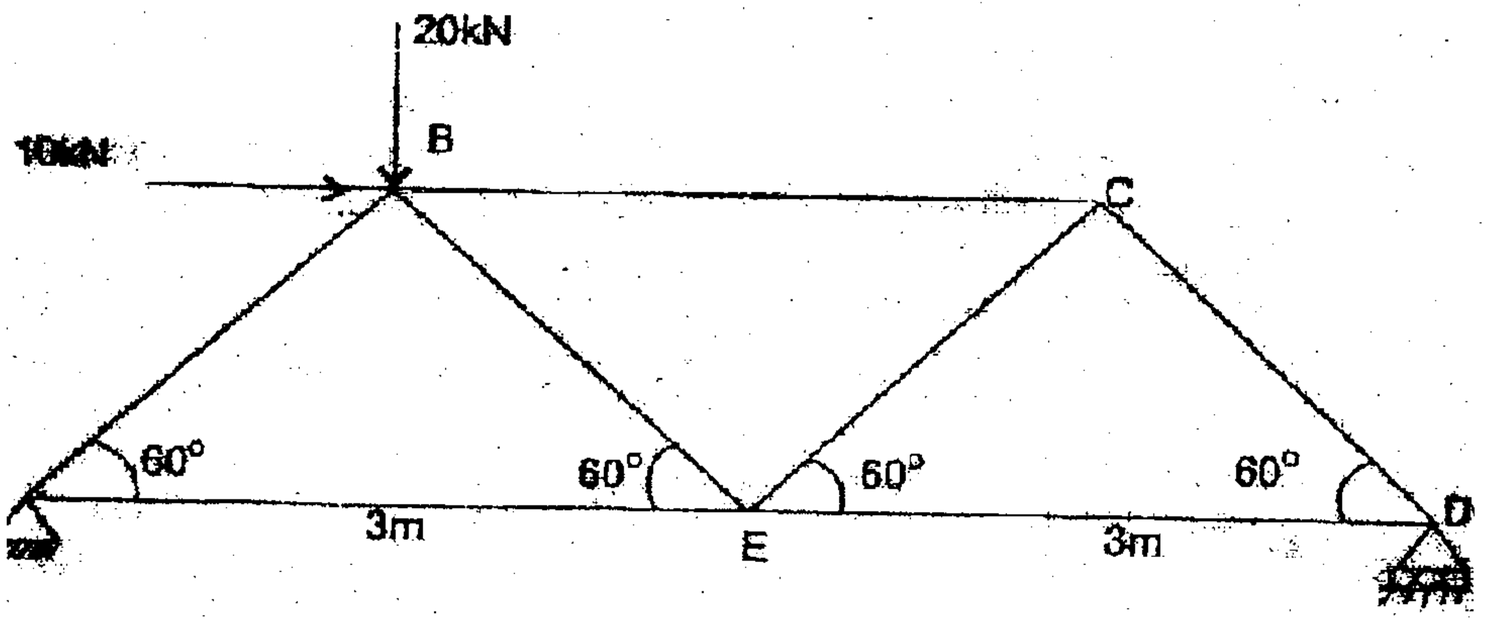


Draw the SFD and BMD for the beam shown in figure, marking the salient points and point of contra flexure.

11. A cantilever beam AB has a span of 3 m. The cross-section of the beam is a circle of 200 mm diameter. It carries a UDL of 10 N/m, extending over a length of 2 m from the left end A, which is the free end of cantilever. Determine the maximum bending stress and shear stress in N/cm^2.

MODULE – IV

12.



In the truss shown in figure determine : (a) The reaction at A and D (b) The forces in members AB and AE by method of joints (c) The forces in members BC and CE by the method of joints.

13. a) A hollow rectangular column of external depth 1000 mm and external width 800 mm is 100 mm thick. Calculate the maximum and minimum stresses in the section if the load of 200 kN is acting with an eccentricity of 150 mm with respect to YY axis.

b) Determine the buckling load for a strut of T-section, the flange width being 150 mm, overall depth 100 mm and both flange and web13 mm thick.The strut is 3 m long and is hinged at both ends.Take E = 200 GPa.