R09

Code No: 53016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, November/December - 2016

MECHANICS OF SOLIDS

(Common to ME, MCT, MMT, AE, AME, MSNT)

Time: 3 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

- - -

1.a) A piece of material is subjected to two perpendicular stresses as follows: i) Tensile stresses of 100 MPa and 60 MPa ii) Tensile stress of the 100 MPa and compressive stress of 60 MPa iii) Compressive stress of 100MPa and 60MPa. Determine normal and tangential stress on a plane inclined at 30^0 to the plane of 100 MPa stress. Also find the resultant and its inclination with the normal stress.

b) Draw the stress strain diagram for brittle material and discuss the salient points. [8+7]

2.a) A beam of length L carries a uniformly distributed load 'q' per unit run on its whole length. It has one support at its left end and the other support is at a distance 'a' from the other end. Find the value of 'a' so that the maximum bending moment for the beam is as small as possible. Find also the maximum bending for this position. Also plot the shear force and bending moment diagram for the whole beam.

b) What is the importance of shear force and bending moment diagrams of the beams? Explain. [8+7]

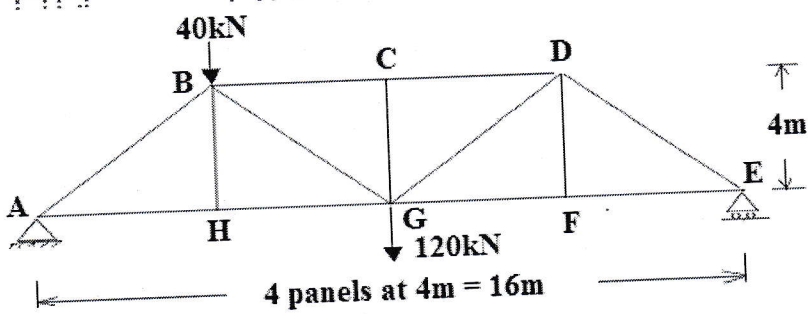
3.a) A wooden beam is 8.0 cm wide and 12 cm deep with a semi-circular groove of 2 cm radius planned out in the center of each side. Calculate the maximum stress in the section when simply supported on a span of 3.0 m, loaded with a concentrated load of 450 N at a distance of 1.0 m from the one end and a UDL of 500 N/m run over the entire span.

b) Derive equation for maximum bending stress developed in the circular shaft. [8+7]

4.a) What is the shear stress distribution in I cross section and discuss the importance of shear stress?

b) A beam of square cross-section is used as a beam with one diagonal horizontal. Obtain the magnitude and location of maximum shear stress in the beam. Draw the variation of shear stress across the section. [7+8]

5. Find forces in members BC, HG, BG and DG of the truss shown in figure below. [15]



6.a) A cantilever beam of length 7 m, carries a point load 60 kN at a distance of 5 m from the fixed end. Find the deflection and slope under the point load and also at the free end. Take E = 2.1×10^5 MPa and I = 89×10^6 mm^4.

b) What are the assumptions made to find the deflections and slopes in the beam? Explain in detail. [8+7]

7.a) State the assumptions made in the analysis of thin cylindrical shells.

b) A shell 5 m long, 1.4 m in diameter is subjected to an internal pressure of 1.4 MPa. If the thickness of the shell is 10 mm, find the circumferential and longitudinal stresses. Find also maximum shear stress and the changes in the dimensions of the shell. Take E = 2.07×10^5 N/mm^2 and Poisson's ratio = 0.3. [7+8]

8.a) A cylindrical compressed air drum is 2 m in diameter with plates 12.5 mm thick. The efficiencies of the longitudinal (η_L) and circumferential (η_c) joints are 85% and 45% respectively. If the tensile stress in the plating is to be limited to 100 MPa, find the maximum safe air pressure.

b) Show that the volumetric strain of cylindrical shell is the sum of longitudinal strain and twice that of hoop strain. [8+7]

---ooOoo---