Code: R7220103 **R7**

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

STRENGTH OF MATERIALS - II

(Civil Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

*****

1 Determine the diameter of a bolt which is subjected to an axial pull of 12 kN together with a transverse shear of 6 kN. Take the elastic limit in simple tension as 300 MPa. Factor of safety = 3 and Poisson's ratio = 0.3. Calculate the diameter of the bolt using:
(i) Maximum principal stress theory. (ii) Maximum principal strain theory.
(iii) Maximum shear stress theory. (iv) Maximum strain energy theory.
(v) Maximum shear strain energy theory.

2 (a) A solid shaft of 175 mm diameter is used to transmit torque. Find the maximum torque that can be transmitted by the shaft if the shear stress is not to exceed 45 MPa.

(b) The shearing stress in a solid shaft is not to exceed 50 MPa when the torque transmitted is 45, 000 N-m. Determine the minimum diameter of the shaft required.

3 A T-section joist is made of 150 mm × 20 mm flange at top and a web of 20 mm thickness. The overall depth is 120 mm. This T-section is used as a strut with both ends fixed. Determine the Euler's crippling load for the column. Take E = $2x10^5$ MPa.

4 Show that the maximum bending moment of a strut of length "l", subjected to an axial compressive load 'P' and a concentrated lateral load "W" at the centre is given by: $\frac{W}{2}\times\sqrt{\frac{EI}{P}}\times\tan\left(\frac{l}{2}\times\sqrt{\frac{P}{EI}}\right)$. The strut is pinned at both the ends. EI is the flexural rigidity for the strut.

5 A hollow rectangular column is having external and internal dimensions as 120 cm deep × 80 cm wide and 90 cm deep × 50 cm wide respectively. A vertical load of 200 kN is transmitted in the vertical plane bisecting 120 cm side at an eccentricity of 10 cm from the geometric axis of the section. Calculate the maximum and minimum stresses in the section.

Contd. in Page 2

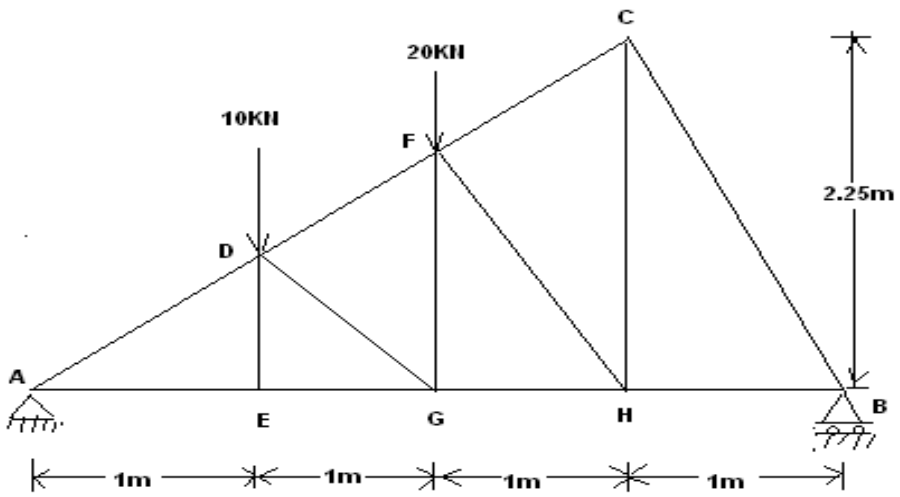
Code: R7220103

R7

6 A 100 mm × 100 mm × 12.5 mm steel angle is used as a cantilever of span 1.5 m and carries an end load. One leg of the angle is horizontal and the load at the end is vertical with its line of action passing through the centroid of the section. Determine the maximum allowable load if the bending stress is not to exceed 130 MPa.

7 A circular beam of radius 5.3 m is simply supported on symmetrically placed columns. The angle subtended by two consecutive columns at the centre is 34^0. The beam carries a uniformly distributed load of intensity 9 kN/m. Calculate the location and magnitude of maximum bending moment in the beam.

8 The pin jointed truss shown below is supported by a hinge at A, and on rollers at B. Analyze the truss by method of joints and determine forces in the members AD, AE, DE, DG, and FG.



*****