

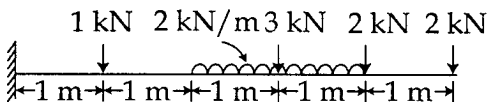
B.TECH. CIVIL ENGINEERING**Term-End Examination****December, 2013****BICE-008 : STRUCTURAL ANALYSIS-I**

Time : 3 hours

Maximum Marks : 70

Note : Attempt any seven questions. Use of scientific calculator is permitted. Assume any missing data suitably.

1. A square steel rod 20mmx20mm in section is to carry an axial load of 100kN in compression. Calculate the shortening in the rod in a length of 50mm. Take $E=2.14 \times 10^8 \text{ kN/m}^2$. 10
2. (a) Define principal stresses and principal planes. 3
 (b) The principal stresses at a point across two perpendicular planes are 75 kN/m^2 (tensile) and 35 kN/m^2 (tensile). Find normal and tangential stresses and its obliquity on a plane at 20° with major principal plane. 7
3. Draw S.F. and B.M. diagrams of cantilever beam as shown in Fig(1) 10



(Fig. 1)

4. A hollow circular steel bar having outside diameter twice the inside diameter is used as a beam. From B.M.D. of beam, it is found that the bar is subjected to a maximum bending moment of 40kNm. If the allowable bending stress in the beam is to be limited to 100MN/m². Find the inside diameter of the bar. 10
5. Derive an expression for the shear stress ' τ ' at a point in a transverse rectangular section subjected to a shear force 'S'. 10
6. A solid round bar 60mm in diameter and 2.5m long is used as a strut. One end of the strut is fixed, while other end is hinged. Find the safe compressive load using Euler's formula. Assume E=200GN/m² and F.O.S=3. 10
7. A rectangular strut is 20cm wide and 15cm thick. It carries a load of 60kN at an eccentricity of 2cm in a plane bisecting the thickness. Find maximum and minimum intensities of stress in the section. 10
8. A solid steel shaft has to transmit 75kW power at 200r.p.m. Taking allowable shear stress as 70MN/m², find the suitable diameter of the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 30%. 10
9. Write short notes on *any two* of the followings :
(a) Shear centre 2x5=10
(b) Properties of steel
(c) Hardness and fatigue testing