Total No. of Questions : 8]

SEAT No. :

PC2783

[Total No. of Pages :3

[6352]-7

S.E. (Civil)

MECHANICS OF STRUCTURE

(2019 Pattern) (Semester- III) (201002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***If necessary, assume suitable data and indicate clearly.***
4) ***Use of electronic pocket calculator is allowed.***

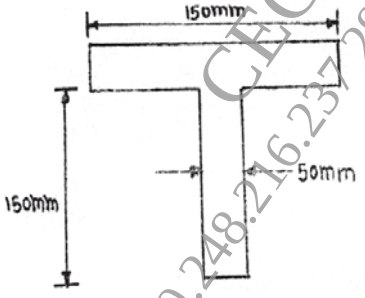
Q1) a) A T-section with flange 200mm×50mm and web 200mm×50 mm is subjected to a vertical shear force of 200 kN. Calculate shear stress at the junction of the flange and web and shear stress at the junction of the flange and web and shear stress at the neutral axis. Sketch the shear stress diagram. **[9]**

b) A symmetric I section is 150 wide and 200 deep. The flange thickness and web thickness is 10 mm. This section is used for cantilever beam having span of 3 m and subjected to uniformly distributed load. Find the maximum u.d.l. that can be supported if E=200 GPa and maximum allowable stress is 180 MPa. **[9]**

OR

Q2) a) A T section 100mm×130mm×20mm is subjected to a shear force of 100kN. Draw the shear stress distribution and find the maximum shear stress. **[9]**

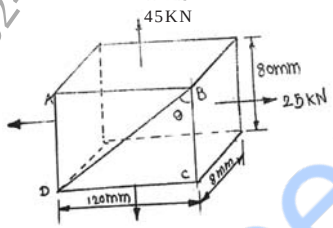
b) Two Wooden Planks 150mm×50mm each are connected to form a T section of a beam. A moment of 6.4kN-m is applied around the horizontal neutral axis. Find the bending stresses at both the extreme fibers of cross-section (Fig.1) **[9]**



P.T.O

Q3) a) A bar of steel is 80mm in diameter and 550mm long. A tensile load of 100kN is found to stretch the bar by 0.25 mm. The same bar when subjected to a torque of 1.4kN.m is found to twist through 3º. Find the value of four elastic constant. **[9]**

b) A block 120mm×80 mm ×8mm thick is subjected to uniformly distributed stress field as shown in Fig.2 Compute the normal stress and shear stress development along the plane BD. Also find out the maximum shear stress and corresponding plane. **[8]**



OR

Q4) a) A metal bar 15mm diameter subjected to pull of 40kN elongated by 0.5 mm over a gauge length of 500 mm. In a torsion test on the same material, maximum shear stress of 45 MPa was measured on a bar of 50 mm diameter and angle of twist over a length of 300 mm was measured 0.4º. Determine Poisson's ratio for the material . **[9]**

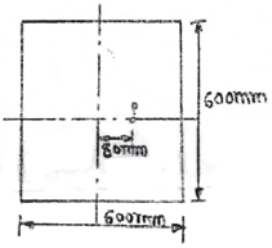
b) The principal tensile stresses at a point are 100 N/mm^2 and 60 N/mm^2. Find normal tangential and resultant stress on a plane at 30º with major principal plane. What is angle of obliquity? Show by sketch how normal stress and tangential stress act. **[8]**

Q5) a) A 4m length of a tube has a buckling load of 2kN when used as a column hinged at both ends. Calculate buckling load for 4.5 m length of the same tube when used as column if: **[8]**

i) Both ends are fixed

ii) One end fixed and other is hinged

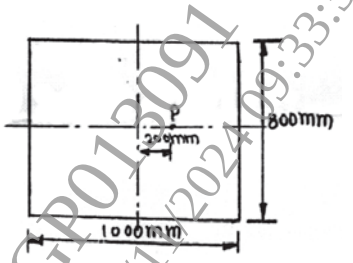
b) A short masonry pillar 600 mm×600 mm in section. The pillar carries an eccentric load of 1000kN acting at an eccentricity of 80 mm from the longitudinal axis as shown in Fig. Find the maximum and minimum stresses on the section. **[9]**



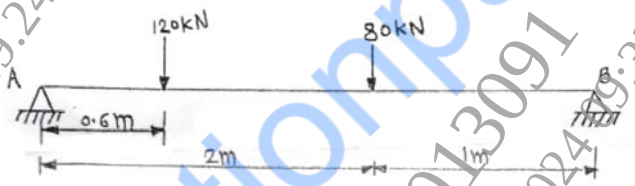
OR

Q6) a) A steel rod 5 m long and of 40 mm diameter is used as a column with one end fixed and other end free. Determine the crippling load by Euler's formula. Take E=200 GPa. **[8]**

b) A column support load of 400 kN is shown in Fig. Find the stresses at the correct of the column at its base. **[9]**



Q7) a) A simply supported beam of 3 m span carries two point load of 120kN at a distance 0.6m and 2m form the left support. If for the beam $I=16\times10^8$ mm^4 and $E=2\times10^5$ N/mm^2, calculate the deflection under loads using Macaulay's Method. **[9]**



b) A rectangular beam 80mm wide and 100mm is 4.5m long and subjected to two point loads 20kN and 15kN at 2m and 3.5m from left supports. Determine strain energy stored in the beam. Take E=200 GPa. **[9]**

OR

Q8) a) A beam of uniform section, 10m long is simply supported at the ends. It carries point loads of 150kN and 65kN at distance of 2.5m and 5.5m respectively from the left end. **[9]**

Calculate:

i) Deflection under each load

ii) Maximum Deflection

Take E=200 kN/m^2 and $I=118\times10^{-4}$ m^4

b) A simply supported beam 4m span with EI constant throughout is subjected to a point load of 24kN at 3 m from left hand support. Find the strain energy of the beam is bending. **[9]**