Total No. of Questions : 8]

SEAT No. :

P1475

[Total No. of Pages : 3

[6002]-102
S.E. (Civil Engineering)
MECHANICS OF STRUCTURE
(2019 Pattern) (Semester - III) (201002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Assume Suitable data, if necessary.***
3) ***Use of Non-Programmable calculator is allowed.***

Q1) a) A simply supported beam of rectangular section 230 mm wide and 450 mm deep is subjected to uniformly distributed load of 60 kN/m on entire span of 4m. Determine maximum bending stress and draw Bending stress Distribution diagram. **[8]**

b) A symmetric 'I' section having flanges each of 150 mm × 20 mm and web of 200 mm × 20mm is subjected to a shear force of 100 kN. Draw shear stress Distribution diagram of the beam. **[9]**

OR

Q2) a) A cantilever beam of span 1m is subjected to two point loads, 100kN at the free end and 50kN at the centre of the beam. The beam is rectangular in section having width of 300 mm and depth 600mm. Determine maximum bending stress and draw Bending stress Distribution diagram. **[8]**

b) A beam of 'T' section having flange of 300 mm × 50mm and web of 400mm × 50mm, is subjected to maximum shear force of 200 KN. Draw Shear stress Distribution diagram. **[9]**

Q3) a) A solid aluminium shaft of 80mm diameter is to be replaced by a hollow steel shaft of 80mm outer diameter. The two shafts have same angle of twist per unit torque over the total length. If the shear modulus of steel is three times the shear modulus of aluminium. Find the inner diameter of the shaft. **[9]**

b) The principal tensile stresses at a point are 85N/mm^2 and 55N/mm^2. Find the normal, tangential and resultant stress on a plane at 25^o with major principal plane. Also find the angle of obliquity. **[8]**

OR

P.T.O.

Q4) a) Find maximum torque that can be safely applied to a shaft of 75mm diameter. The permissible angle of twist is 1° in a length of 4m and permissible shear stress is 40 Mpa. **[9]**

Take G = 80 Gpa.

b) Direct stresses of 150 N/mm^2 and 80 N/mm^2, both tensile exists on two perpendicular planes at a point in a body. Shear stress is also acting along with these direct stresses. **[8]**

If the greatest principal stress at the point is 200 N/mm^2, determine the magnitude of shear stress on the two planes. Also find the maximum shear stress at the point.

Q5) a) A steel column of 4m long and of 100mm diameter is fixed at one end and free at other end. Determine the crippling load by Euler's formula.

Take E = 200 GPa. **[6]**

b) Determine the safe load, an angle strut 75mm × 75 mm × 10mm can carry. The length of the strut is 2m and it is fixed at one end and hinged at the other. Consider factory of safety as 1.5. Minimum radlics of gyration 12.5mm and 6c = 400mpa (crosting 8 trem)

$$a = \frac{1}{7500}$$

Use Rankine's formula. **[6]**

c) Determine core section for a hollow rectangular column of external size B × D and internal size b × d respectively. **[6]**

OR

Q6) a) State assumptions and limitations of Euler's theory. **[6]**

b) Determine ratio of Crippling load given by Euler's and Rankine's formula for a circular column of 60mm diameter and 2.5m long. **[6]**

Take yield stress as 310 MPa.

Rankines constant = 1/7500 and

E = 210 GPa.

c) A rectangular column 300mm × 250mm is subjected to compressive load of 160 kN acting at an eccetricity of 45 mm in a plane bisecting 250 mm side. **[6]**

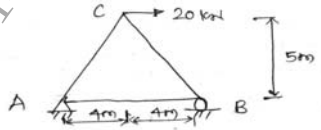
Determine maximum and minimum stresses.

Q7) a) Determine slope and deflection for a simply supported beam loaded as shown below. Use Macaulay's method. **[9]**

b) Determine the vertical displacement at joint 'C' by using unit load method.

Area of each member is 500 mm^2. **[9]**

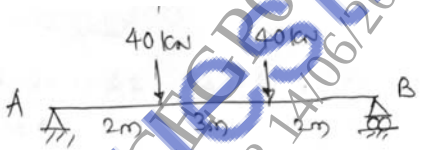
E = 210 Gpa.



OR

Q8) a) Determine maximum slope and deflection for a simply supported beam shown in figure below. **[9]**

Use Macaulay's method.



b) Determine vertical displacement at joint 'C' using unit Load method. **[9]**

Area of each member is 600 mm^2

E = 200 GPa.