Total No. of Questions : 8]

SEAT No. :

PB3602

[Total No. of Pages : 3

[6261]-7
S.E. (Civil Engineering)
MECHANICS OF STRUCTURE
(2019 Pattern) (Semester-III) (201002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Assume suitable data, if necessary.***
3) ***Use of Non-programmable calculator is allowed.***

Q1) a) A simply supported beam of rectangular cross section, 350mm wide and 700mm deep is subjected to uniformly distributed load of 120kN/m on entire span of 3m.

Determine maximum bending stress and draw Bending stress Distribution diagram. **[8]**

b) A 'T' beam is having flange 1000mm×100mm and web 800mm × 80mm. The maximum shear force induced in the beam due to applied load is 400 KN. Draw shear strees distribution diagram for the beam. **[9]**

OR

Q2) a) A cantilever beam of span 1.2m is loaded with a point load of 70KN at its free end. The beam is rectangular in cross section having width 230mm and depth 500mm. Determine maximum bending stress & draw bending stress distribution diagram. **[8]**

b) A symmetric 'I' section having

flanges - 500mm × 25mm

web - 800mm × 20mm.

Maximum shear force induced in the beam due to applied loading is 300KN. Draw shear stress distribution diagram. **[9]**

Q3) a) A hollow circular shaft has an external diameter of 120mm and an internal diameter of 100mm. The maximum permissible shear stress is 80 MPa and the twist is not to exceed 3º in length of 3m. The shaft is rotating at 2RPS if the shear modulus of the material is 80 GPa, find the safe power that can be transmitted. **[9]**

P.T.O.

b) At a point in a material the stress on two mutually perpendicular plane are 140N/mm^2 and 70 N/mm^2, both tensile. Determine normal, tangential and resultant stress at a plane 20º to the major principal plane. **[8]**

OR

Q4) a) Find maximum torque that can be applied to a shaft of 100mm diameter. The permissible angle of twist is 1.2º in a length of 3m and permissible shear stress is 70 MPa.

G = 80 GPa **[9]**

b) An element is subjected to a tensile stress of 120 MPa and a shear strees of 60 MPa tending to rotate the element in an anticlockwise direction.

Determine the magnitude of normal and shear stress on a section inclined at 35º with the tensile stress. **[8]**

Q5) a) A hollow circular column with two ends hinged carrying 10kN axial load. If the outer diameter of the column is 60mm. The column is 6m long. Determine the inner diameter of the column. Factor of safety 2 against buckling. E = 80 GPa. **[6]**

b) Determine the crippling load for a hollow rectangular cast iron column of outer dimensions 300mm × 200mm. Thickness of the column is 30mm. The length of the column is 5m having one end fixed and other hinged. E= 160 GPa. **[6]**

c) A rectangular column 600mm × 400mm is subjected to compressive load of 200kN acting at an eccentricity of 50mm in a plane bisecting 400mm side. Determine maximum and minimum stresses. **[6]**

OR

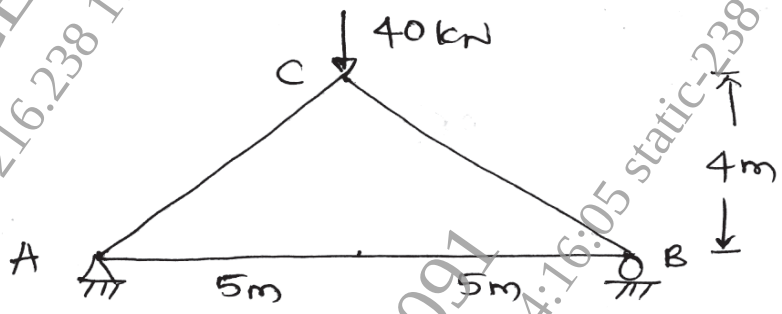
Q6) a) A steel rod 5m long and 100mm diameter is acting as column with one end fixed and other free. Find crippling load by Euler's formula consider E = 210 GPa **[6]**

b) A hollow column, 4m long is fixed at both ends. The external diameter of the column is 350mm and thickness is 25mm. Determine Rankine's crippling load. taking f_c = 550 N/mm^2 and $\alpha = \frac{1}{1700}$ **[7]**

c) Determine the core of section for a circular section of diameter 'D'. **[5]**

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

b) Determine the vertical displacement at joint C by using unit load method Area of the each member of the truss is 400mm^2. E = 210 GPa **[9]**



OR

Q8) a) A cantilever beam of span 'L' is subjected to uniformly distributed load of 'w' kN/m on entire span. Determine slope and deflection at the free end of the beam, using Macaulay's method. **[9]**

b) Determine horizontal displacement at joint 'C'. Area of each member of the truss is 450mm^2. E = 200 GPa. **[9]**