Total No. of Questions : 8]

SEAT No. :

PA-1180

[Total No. of Pages : 3

[5925]-202

S.E. (Civil Engineering)

MECHANICS OF STRUCTURES (MOS)

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Use of non-programable calculator is allowed.***
3) ***Assume any data, if required.***

Q1) a) A symmetric I section is having two flanges, each of 300 mm × 20 mm and vertical web of 20 mm thickness and 160 mm depth. The beam is subjected to shear force 200 kN. Draw Shear Force Distribution diagram. **[9]**

b) A rectangular simply supported beam of 5m span is subjected to a central point load of 100 kN. The given beam is 300 mm wide and 500 mm deep. Determine maximum bending stress induced in the section. Draw Bending Stress Distribution diagram. **[9]**

OR

Q2) a) A 'T' beam, subjected to shear force of 200 kN. The flange is 200 mm × 30 mm and the web is 30 mm thick and 180 mm deep. Draw shear stress distribution diagram. **[9]**

b) A symmetric I section of flanges 120 mm × 20 mm and web of thickness 20 mm and 100 mm depth, carrying uniformly distributed load of magnitude 80 kN/m over 4 m span. Calculate the maximum bending compressive stress. **[9]**

P.T.O.

Q3) a) A solid circular shaft of diameter 90 mm rotates at 130 rpm. The twist is observed as 3° over 6 m span. **[9]**

Determine power transmitted.

Take G = 80 GPa.

b) Determine normal, tangential and resultant stresses on a plane at 25° with major principal plane. The principal stresses of 120 MPa tensile on major principal plane and 50 MPa compressive on minor principal plane are acting at a point on the member. **[8]**

OR

Q4) a) A solid circular shaft transmits 220 kW at 160 rpm. The maximum allowable shear stress is 60 MPa and angle of twist permitted is 2° in 3m length. Design suitable shaft. Take G = 78 GPa. **[9]**

b) A circular bar of diameter 80 mm diameter is subjected to axial compression force of 200 kN. Determine shear stress on a plane, on which the normal stress is 100 MPa. **[8]**

Q5) a) Compare the crippling loads given by Euler's and Rankine's formulae for a steel strut 2.5 m long having outer & inner diameter as 40 mm and 30 mm respectively loaded through pin jointed at the ends. Take yield stress as 320 N/mm^2 the Rankine's constant $\frac{1}{7500}$, E = 2 × 10^5 MPa. **[9]**

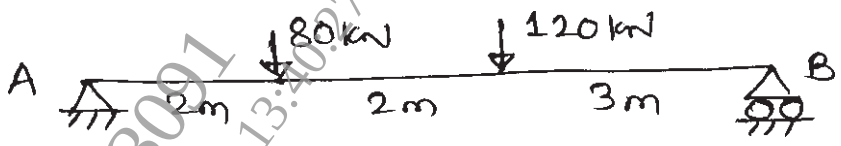
b) Explain 'Core of the Section' and obtain a core section for a hollow circular column of external and internal diameter 'D' and 'd' respectively. **[9]**

OR

Q6) a) A steel rod 6m long and 30 mm diameter is used as a column. One end is fixed and other is free. Determine the crippling load by Euler's formula. Take E = 200 GPa. **[9]**

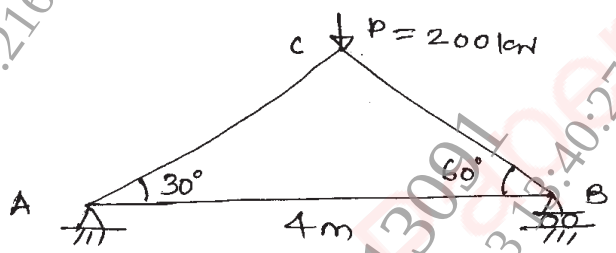
b) A rectangular column of 240 mm × 150 mm is subjected to a vertical load of 110 kN, acting at an eccentricity of 60 mm in a plane bisecting 150 mm side. Determine the maximum and minimum stresses. **[9]**

Q7) a) The beam is supported and loaded as shown in figure. Determine the position and value of Maximum deflection EI = 1.4×10^{11} kN-mm^2. Use Macauly's method. **[9]**



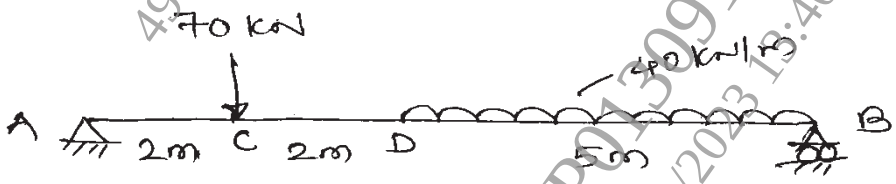
b) Determine the vertical and horizontal deflection at point 'C' for the truss shown below. **[8]**

E = 200 GPa A = 2×10^{-4} m^2 for all members.



OR

Q8) a) Find slope at supports and at point 'C', deflection at 'C' and 'D' for the given beam using Macaulay's method. **[9]**



b) Determine the deflection and slope at the free end of cantilever beam of span '*l*' m, loaded with central point load 'w' kN. **[8]**

E 1 is constant.