

Total No. of Questions : 8]

SEAT No. :

PE4236

[6582]-7

[Total No. of Pages : 4

S.E. (Civil Engineering)
MECHANICS OF STRUCTURES
(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 cantilever beam of span 1.5m is carrying uniformly distributed load of 50kN/m on entire span. The beam is rectangular having 230mm width and 450 mm depth.

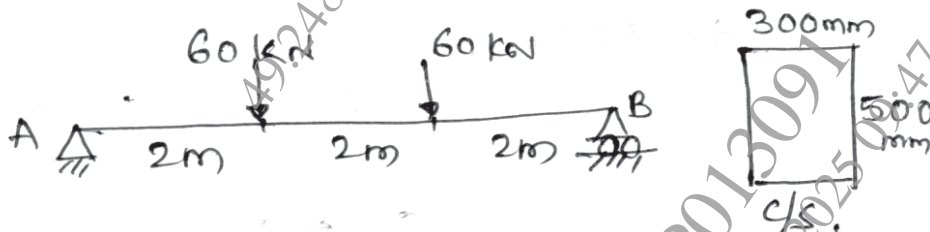
Determine maximum bending stress and draw Bending stress Distribution diagram. [8]

b) A beam of 'T' section having flange of 800 mm × 50 mm and web of 600 mm × 30mm, is subjected to load, due to which shear force of 100kN is induced in the beam.

Draw shear stress Distribution diagram. [9]

OR

Q2) a) A simply supported beam of rectangular cross section is carrying two point loads of 60 kN, each at 2m from each support as shown. The cross section of the beam is shown below. Draw Bending stress Distribution diagram. [8]



b) Draw shear stress Distribution diagram for the beam having maximum shear force 150kN. The beam is symmetric 'T' section having- [9]
flanges : 600 mm × 40 mm
web : 800 mm × 40 mm

P.T.O.

Q3) a) A solid circular shaft is used to transmit 50 kW at 220 rpm.

The maximum permissible shear stress is 110 N/mm^2 and the angle of twist is not to exceed 1° in the length of 2m. Calculate the diameter of the shaft for safe transmission of the power. [9]

b) The principal stresses at a point across two mutually perpendicular planes are 110 N/mm^2 and 85 N/mm^2 , both are tensile, Determine the normal, tangential and resultant stress on a plane 30° with major principal plane. [8]

OR

Q4) a) A hollow circular shaft of 250 mm external diameter and thickness 20 mm is rotating at 150 rpm. The angle of twist in 4m length was found to be 0.8° . Calculate the power transmitted by the shaft and the maximum shear stress induced.

$G = 80 \text{ Gpa}$. [9]

b) Direct stresses of 200 N/mm^2 tensile & 100 N/mm^2 compressive are acting on two perpendicular planes at a point in a body. These stresses are accompanied by shear stresses on the planes. The major principal stress is 250 N/mm^2 Determine the magnitude of shear stresses on the planes also calculate maximum shear stress at the point. [8]

Q5) a) State the assumptions made in Euler's theory and its limitations. [4]

b) Determine the crippling load given by Rankine's formula for a tubular strut 3.5m long having outer diameter 50mm and inner diameter 40 mm. [7]

Assume both ends pinjointed. Consider $f_y = 315 \text{ mpa}$ and $\alpha = \frac{1}{7000}$

c) A rectangular column of $500 \text{ mm} \times 300 \text{ mm}$ is carrying a compressive load of 150 kN acting at an eccentricity of 40 mm in a plane bisecting 300 mm side. Determine maximum and minimum stresses. [7]

OR

Q6) a) Explain core of a section. Determine core of section for a rectangular column of size $B \times D$. [6]

b) Determine crippling load by Euler's formula for a column 5m long with one end fixed and other end hinged. The diameter of the solid column is 60 mm $E = 210$ Gpa. [6]

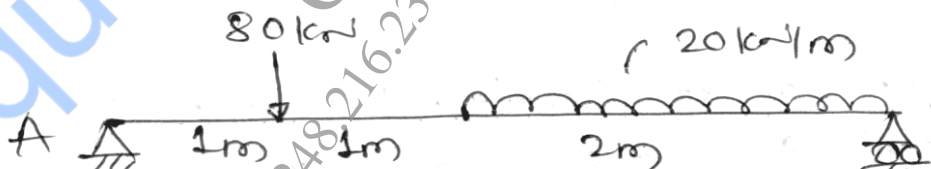
c) A hollow tubular steel strut is 3m long and having outer diameter 60mm [6] and inner diameter 50 mm.

Both end of the column are hinged. Consider yield stress as 315 N/mm^2 and Rankine's constant as $\frac{1}{7500}$ modulus of elasticity is 205 Gpa.

Determine crippling load by using Rankine's formula.

Q7) a) A cantilever beam of span 'L' is carrying uniformly distributed load of 'W' kN/m on entire span of the beam. Determine maximum slope and deflection in the beam. Use strain Energy method or MaCaulay's method. [9]

b) Determine maximum slope and central deflection for a simply supported beam, shown in the figure below. [9]



OR

Q8) a) Determine slope and deflection for a cantilever beam at its free end. The span of the beam is 1m and it is carrying a uniformly distributed load of 30 kN/m on entire span, along with a point load of 60 kN at its free end. Use MaCaulay's method. [9]

b) Determine horizontal displacement at joint 'C' of the truss. [9]

The cross sectional area of each member is 250 mm^2

$E = 200 \text{ Gpa}$

