

Seat No.	
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S.E. (Civil) (Semester - IV) (Revised) Examination, November - 2015

STRUCTURAL MECHANICS

Sub. Code : 63344

Day and Date : Monday, 30 - 11 - 2015

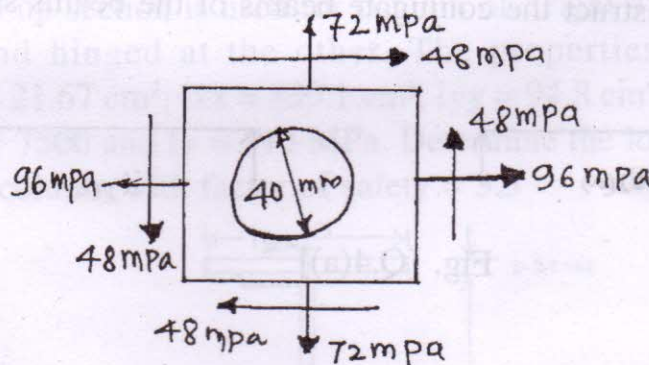
Total Marks : 100

Time : 10.00 a.m to 01.00 p.m.

- Instructions :
- 1) Attempt all questions.
 - 2) Figures to the right indicate full marks.
 - 3) Assume any suitable data, if required and clearly mention it.

SECTION - I

- Q1) a) Define 'Obliquity'. How is it determined? [4]
- b) A circle of 40 mm diameter is marked on a steel plate before it is stressed as shown in fig. As a result of these stresses, the circle deforms to an ellipse. Calculate the lengths of the major and minor axes of the ellipse and their directions. Assume $E = 200 \text{ GPa}$ and $\nu = 0.25$. [12]



- Q2) a) Explain the different conditions for the stability of a dam. [5]
- b) A masonry retaining wall of trapezoidal section is 8m high and retains earth which is level upto the top. The width at the top is 2m and at the bottom 4 m and the exposed face is vertical. Find the maximum and minimum intensities of normal stress at the base. Take density of earth $= 18,000 \text{ N/m}^3$, Density of masonry $= 22,000 \text{ N/m}^3$, Angle of repose $= 30^\circ$. [13]

Q5) Attempt any TWO

[2 × 9 = 18]

- a) A solid shaft of 80 mm dia. is subjected to a twisting moment of 8 MN.mm and a bending moment of 5 MN.mm Determine i) Principal stresses ii) Position of the plane on which they act iii) Max. Shear stress
- b) A solid shaft is subjected to a bending moment of 2.3 kN.m and twisting moment of 3.45 kN.m. Find the dia. of the shaft if the permissible tensile and shear stress in the material of the shaft are not to exceed 703 and 422 MPa respectively.
- c) A cylindrical shell made of M.S. plate has 1.2 m dia. and is subjected to internal pressure of 1.5 MPa . If the yield stress is 200 MPa , calculate the thickness of the plate required on the basis of i) Max. Principal stress theory ii) Max. Shear stress theory iii) Max. Shear strain energy theory. Take factor of safety = 3 in each case.

Q6) a) Derive with usual notations Rankine's formula for long column. [6]

OR

Derive formula for Euler's crippling load for column with both ends hinged.

- b) A built up section is used for column of height 4 m. It is fixed at one end and hinged at the other. The properties of the R.S.J. are Area = 21.67 cm², I_{xx} = 839.1 cm⁴, I_{yy} = 94.8 cm⁴, Rankine's constant $\alpha = 1 / 7500$ and $f_y = 315$ MPa. Determine the load carrying capacity of the column with factor of safety = 3.5 [10]

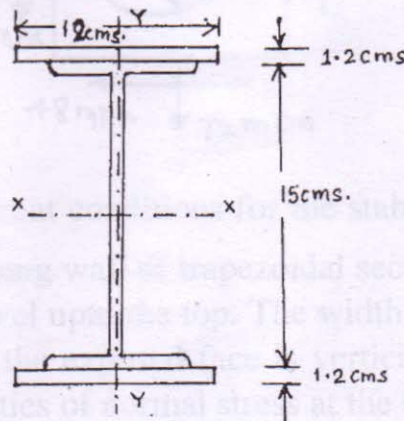


Fig. [Q.6 (b)]

