22303

12425

03 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following: **10**

a) State M.I. of a semi-circular lamina about both axis having base dia. D.

b) Define Resilience and modulus of Resilience.

c) With an expression, state Hooke's law.

d) State the relation between modulus of elasticity and modulus of rigidity with meaning of each term.

e) Define point of contraflexure.

f) State any four assumptions made in theory of simple bending.

g) Define slenderness ratio of column.

Marks

2. Attempt any THREE of the following: **12**

a) Along with neat sketch and expression. State parallel axis theorem.

b) Draw SFD and BMD for a simply supported beam of span 6 m carrying an udl of 10 kN/m over its entire span. It also carries a point load of 35 kN at 2 m from the left support.

c) Find MI of symmetrical I. section about both axis having following details:

Flanges 100 × 20 mm, overall depth 280 mm thickness of web 10 mm.

d) From a plate 4 cm × 8 cm a triangular portion is cut-off as shown in Figure No. 1. Calculate MI of remainder about horizontal line PQ passing through base of the lamina.

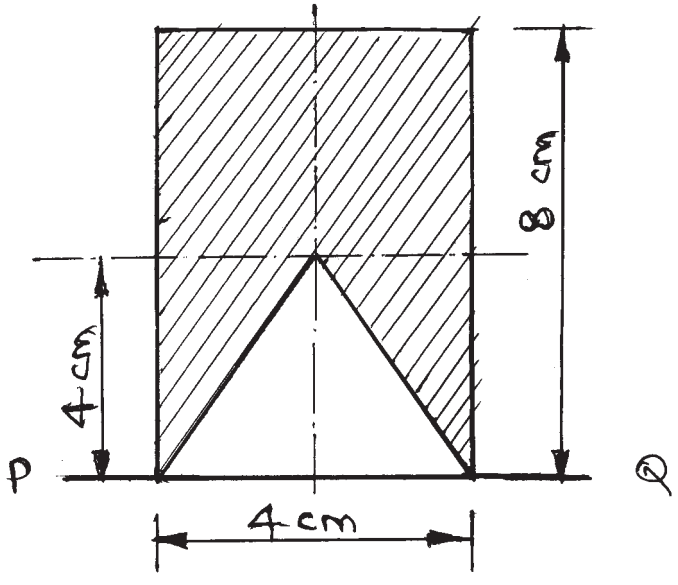

Fig. No. 1

3. Attempt any THREE of the following: **12**

a) A square steel rod having side 25 mm. and 2 m. long is subjected to an axial pull of 55 kN. Find:

i) Stress

ii) Elongation

Take E = 200 GPa.

Marks

b) A stepped bar ABC is axially loaded as shown in Figure No. 2. If maximum stress induced in the bar is 100 MPa. Calculate the value of load P. Also calculate net deformation of the bar. Take E = 110 GPa.

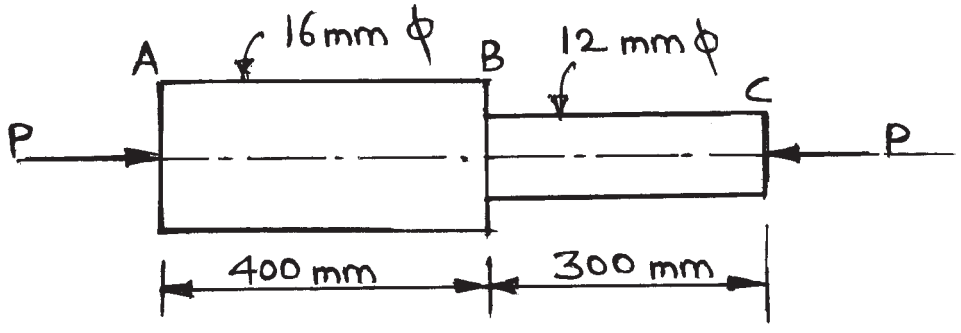

Fig. No. 2

c) A RCC column 450 mm × 300 mm is reinforced with 06 bars of 16 mm diameter. Calculate stresses induced in steel and concrete, column is carrying an axial load of 900 kN. Take modular ratio = 18.

d) A metal rod 2 m long is at temperature 20°C. Find the expansion of rod when temperature is raised to 90°C. If this expansion is prevented. Find temperature stress developed in metal rod. Take E = 1×10^5 N/mm^2. and $\alpha = 12 \times 10^{-6}$ per°C.

4. Attempt any THREE of the following: **12**

a) A metal rod 20 mm. diameter and 2.5 m long when subjected to tensile force 70 kN shows an elongation 2.5 mm and reduction in diameter 0.006 mm. Calculate modulus of elasticity, Poisson's ratio and bulk modulus.

b) In a bi-axial force system, the stresses along the two directions are σx = 50 N/mm^2 and σy = 30 N/mm^2 both tensile. Determine the strain developed in X and Y directions. Given μ = 0.25 and E = 2×10^5 N/mm^2.

c) Draw SFD and BMD for simply supported beam loaded with point load W at the centre of span L.

d) A rectangular column 300 mm × 200 mm cross section and 3 m length is fixed at both ends. Calculate Euler's buckling load the column can carry. Take E = 2×10^5 N/mm^2.

Marks

e) Find crippling load by Rankine's formula for a hollow circular column having 200 mm external diameter and 25 mm thickness length of column is 5 m with both ends hinged.
Take σc = 550 N/mm^2, $\alpha = \frac{1}{1600}$.

5. Attempt any TWO of the following: **12**

a) A simply supported beam of span 6 m carries point load 100 kN at 1 m and anti clockwise couple 40 kN. m at 3 M from left support. Draw shear force and bending moment diagrams of the beam.

b) A cantilever of 3 M span carries udl of 4 kN/m over entire span and point load of 5 kN at 2 M from free end. Draw SF and BM diagrams of the beam.

c) Draw SF and BM diagrams for an overhanging beam as shown in Figure No. 3. Locate point of contra shear and calculate maximum bending moment.

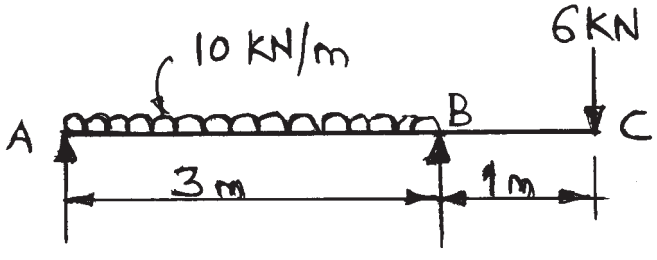

Fig. No. 3

6. Attempt any TWO of the following: **12**

a) i) Write flexural formula with meaning of each term.

ii) If average shear stress developed in a circular beam section is 75 MPa. Find maximum shear stress.

b) A rectangular section 4 M long is used as cantilever beam carrying udl 5 kN/m over entire span. If permissible bending stress in a section is 5 N/mm^2. Find the size of section. Take d = 2b.

c) A T-section having flange 200 mm × 40 mm and web 40 mm × 200 mm, overall depth 240 mm is used as beam. It is subjected to shear force 75 kN. Calculate shear stress and draw shear stress distribution diagram. N.A. is at 80 mm from top.