17311

11920

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

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

(3) Illustrate your answers 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. (A) Solve any SIX of the following : **12**

(a) State the parallel axis theorem.

(b) State the Hook's law.

(c) Explain Bulk modulus and express it.

(d) Draw shear force and bending moment for simply supported beam subjected to udl W & length L.

(e) Draw bending stress distribution diagram for a I section used as cantilever beam.

(f) Draw shear stress distribution for circular section in SSB.

(g) State meaning of slenderness ratio.

(h) Define strain energy.

(B) Solve any TWO of the following : **8**

(a) If polar moment of inertia of a circular section is 2000 mm^4 then calculate diameter of the section.

(b) Determine the tensile force on a steel bar of circular cross-section 25 mm diameter, if strain equal to 0.75×10^{-3} consider E for steel = 200 GPa.

(c) Derive relationship between E, G & K.

2. Solve any TWO of the following : **16**

(a) Determine the moment of inertia of given fig.

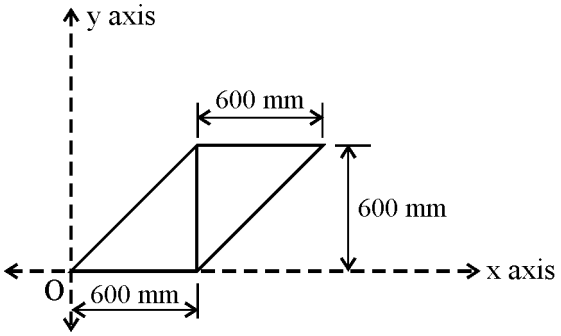

Fig.

(b) A R.C.C. column 400 mm × 400 mm is reinforced with 4 bars of 20 mm of diameter. Determine stresses induced in steel and concrete. If it is subjected to an axial load of 500 kN. Take modular ratio $\frac{E_s}{E_c} = 13.33$.

(c) A metal rod of 20 mm diameter and 2.5 m long when subjected to a tensile force 70 kN showed an elongation of 2.5 mm and reduction in diameter 0.006 mm. Calculate modules of elasticity and modulus of rigidity.

3. Attempt any TWO of the following : **16**

(a) A steel tube 40 mm inside diameter and 4 mm metal thickness is filled with concrete.

Determine stress in each material due to an axial thrust of 60 kN.

Take E for steel = 2.1×10^5 N/mm^2

E for concrete = 0.14×10^5 N/mm^2

(b) An over hanging beam is supported at A & B with AB = 7 m & BC = 2.5 m BC being overhand the beam is subjected to udl 80 N/m over entire span.

Draw bending moment diagram and state maximum value of bending moment and point of contraflexure.

(c) A beam section 100 mm × 200 mm is subjected to a shear force of 60 kN. Determine the shear stresses induced on a layer at 50 mm above NA and 25 mm below the NA.

4. Attempt any TWO of the following : **16**

(a) A tee section has a flange 210 mm × 12 mm a vertical web 180 mm × 15 mm. Calculate moment of inertia about both the axis passing through its centroid.

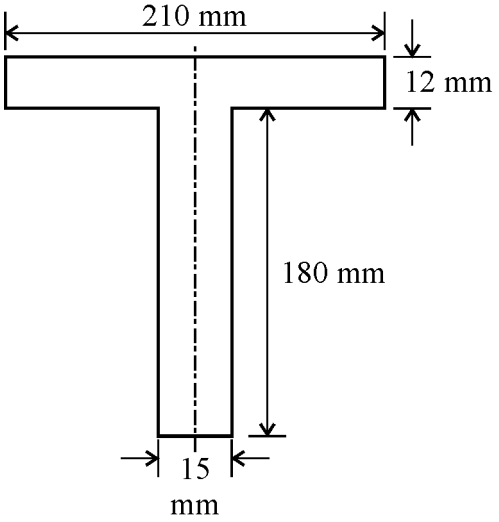

Fig.

(b) A square bar 400 mm^2, 2 m long elongates 1 mm under an axial load of 40 kN. Modulus of rigidity is 80 GPa. Calculate (i) Bulk modulus (ii) Poissons ratio.

(c) A rectangular beam is simply supported over a span 4 m. What udl the beam can carry if the permissible stress in bending is not to exceed 90 N/mm^2. Assume depth = 280 mm and $1_{xx} = 9 \times 10^6$ mm^4.

5. Attempt any TWO of the following : **16**

(a) Determine M.I. of fig. given below about centroidal *xx* and centroidal yy axis.

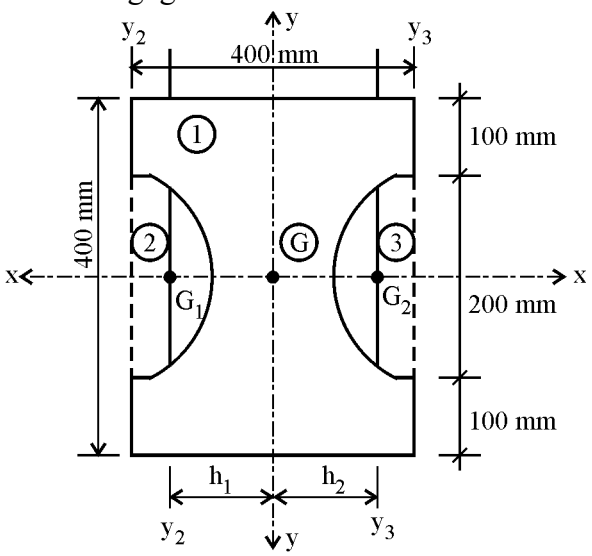

Fig.

P.T.O.

(b) Draw S.F. and B.M. diagram for the cantilever beam as shown in fig. given below indicate the value of important points

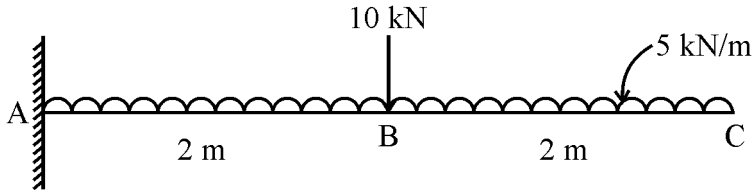

Fig.

(c) Compare the crippling loads by Euler's and Rankine's formula for a strut with both end's fixed 3.0 m long, 40 mm & 30 mm internal diameter,

Take E = 200 GPa, $\alpha = \frac{1}{7500}$, σ_c = 320 MPa.

6. Attempt any TWO of the following : **16**

(a) Draw stress-strain curve for mild steel under tensile loading. Also explain behaviour of the material respect to salient points on the graph.

(b) A hollow circular column 6 m long has to transmit a load of 900 kN, using Rankine's formula and factor of safety 4. Design a suitable section if both ends of columns are fixed.

Take internal diameter = 0.8 × external dia.

f_c = 550 MPa, $\alpha = \frac{1}{1600}$.

(c) A bar 20 mm diameter and 1000 mm long is hung vertically and a collar is attached at the lower end. A weight of 1000 N. falls through a height of 250 mm on the collar. Calculate the maximum instantaneous, elongation and the strain energy stored in the bar.

Take E = 2×10^5 N/mm^2
