313308

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) 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) Define moment of Inertia.

b) Define Radius of gyration.

c) State Hooke's Law.

d) Define shear force and bending moment.

e) Give the relation between average and maximum shear stress for rectangular and circular cross-section.

f) State any two assumptions in theory of pure bending.

g) State the middle third rule.

Marks

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

a) State the parallel axis theorem with mathematical formula.

b) Define 'Polar moment of Inertia'. Calculate Polar moment of Inertia for square lamina of side 40 cm.

c) A mild steel flat 120 mm wide, 12 mm thick and 5 m long carries an axial load of 25 kN. Find stress, strain and change in length of bar. Take $E = 2 \times 10^5$ N/mm^2.

d) Calculate the M.I. for the following given section.

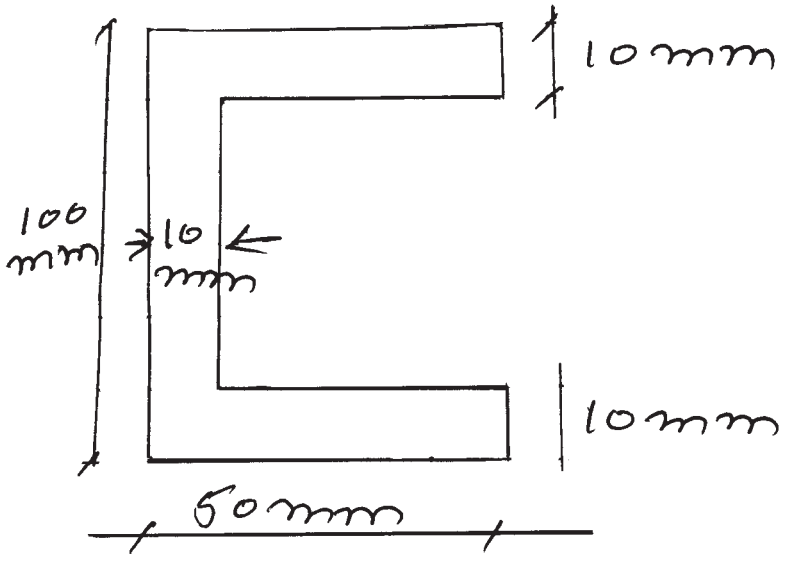

Fig. No. 1

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

a) State the relation between E, G, K.

b) Define :–

i) Normal stress

ii) Direct stress

iii) Bending stress

iv) Shear stress

Marks

c) A steel bar 800 mm^2 cross-sectional area is subjected to axial forces as shown in Figure No. 2. Find total change in length of the bar if $E = 2 \times 10^5$ N/mm^2.

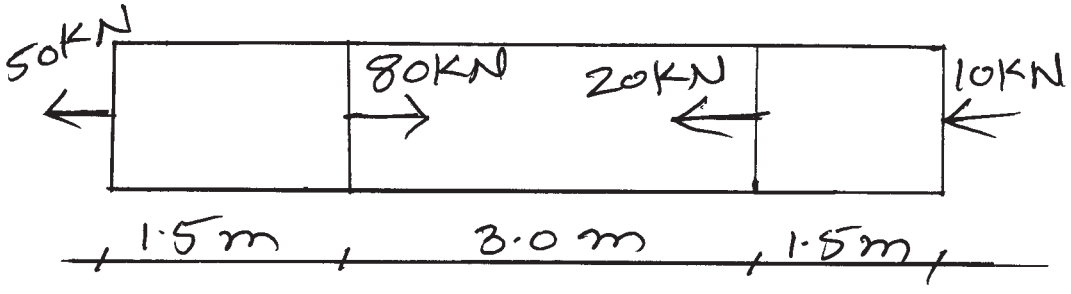

Fig. No. 2

d) A cube of 200 mm side is subjected to a compressive force of 3500 kN. on all its faces. The change in volume of the cube is 5000 mm^3. Calculate the bulk modulus and modulus of elasticity if Poisson's ratio is 0.28.

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

a) Draw S.F.D. and B.M.D. for a simply supported beam as shown in Figure No. 3.

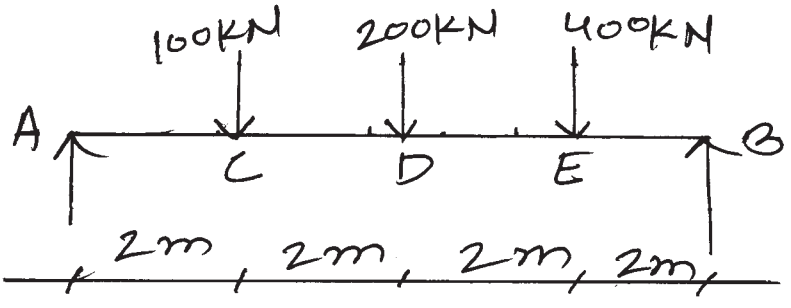

Fig. No. 3

b) A simply supported beam of rectangular section 150 mm wide 300 mm deep is simply supported over a span of 4.0 m. It carries UDL 10 kN/m over entire span. Find the maximum and minimum bending stress induced in the section. Draw bending stress distribution diagram.

Marks

c) Draw shear stress distribution along cross section of circular beam for 300 mm diameter carrying 400 kN shear force. Also determine the ratio of maximum shear stress to average stress.

d) State the Rankin's formula with meaning of each term used in it.

e) A short column of hollow rectangular c/s has external dimensions 2.4 m × 1.8 m and is 20 mm thick. It carries a vertical load of 500 kN at an eccentricity of 30 mm from the geometric axis of the section bisecting the longer side. Find maximum and minimum stress intensities.

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

a) A cantilever fixed at left end is 2 m. long and carries an UDL of 500 N/m. A point load of 800 N and 600 N act at 1 m and 2 m from fixed end respectively. Draw SF and B.M. diagrams.

b) Draw the shear force and bending moment diagrams for the beam as shown in Figure No. 4.

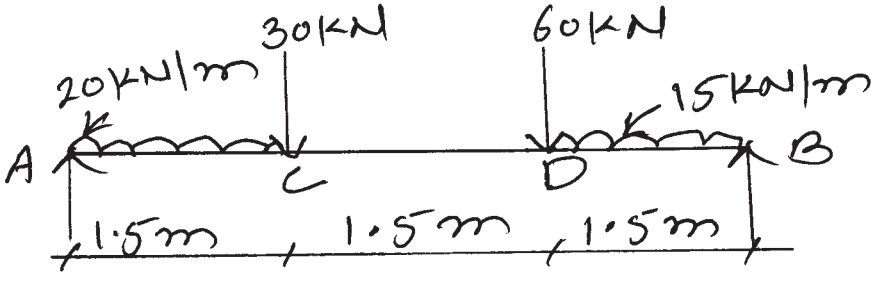

Fig. No. 4

c) Draw SF and B.M. diagram for the overhanging beam as shown in Figure. No. 5

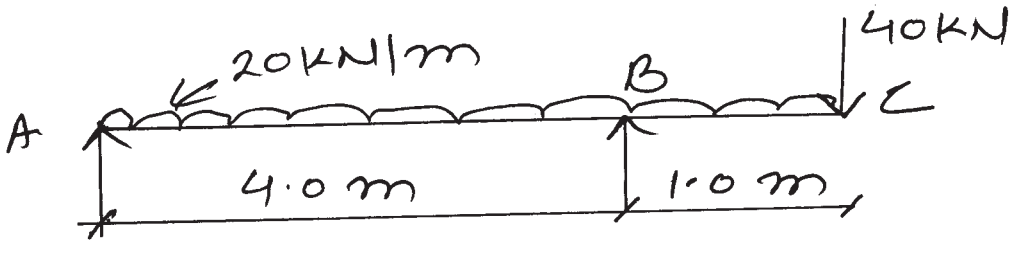

Fig. No. 5

Marks

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

a) Calculate the moment of inertia about the base of composite lamina made up of a semicircle of 150 mm base diameter is removed from base of rectangle 150 mm × 150 mm such that lamina is symmetrical to Y–axis.

b) 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 40 mm above N.A. and 20 mm below the N.A.

c) Determine the limit of eccentricity for a hollow circular section having D = 300 mm and d =100 mm also draw stress distribution diagram.

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