313308

24225

3 Hours / 70 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. Attempt any FIVE of the following : **10**

a) Define –

i) Moment of inertia

ii) Radius of gyration

b) State the parallel axis theorem.

c) Define –

i) Point of Contra-Flexure

ii) Point of Contra-shear

d) Define section modulus and neutral axis.

e) State the condition of no tension at the base of column.

f) Differentiate between single shear and double shear.

g) Draw a neat sketch to show core of rectangular section of (B × D) dimensions.

P.T.O.

Marks

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

a) A hollow square has inner dimensions a × a and outer dimensions 2a × 2a. Find moment of inertia about the outer side.

b) Draw stress-strain diagram with all important points on it for mild steel material subjected to gradually applied axial tensile load.

c) For a certain material, modulus of elasticity is 169 MPa. If Poisson's ratio is 0.32 calculate the values of modulus of rigidity and bulk modulus.

d) A cantilever beam of span 3 m carries a point load of 5 kN at 2 m from the support and u.d.l. of 4 kN/m over the entire span. Draw S.F. and B.M. diagrams.

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

a) A circular disc has diameter of 80 mm. Calculate M.I. about its any one tangent.

b) A cube of 50 mm side is subjected to a force of 6 kN (Tensile), 8 kN (compressive) and 4 kN (Tensile) along X, Y, Z respectively. Determine change in volume. Take E = 200 GPa and m as $^{10}/_{3}$.

c) A simply supported beam of span 7 m carries an u.d.l. of 2 kN/m over 4 m length from left hand support and a point load of 5 kN at 2 m from right hand support. Draw S.F. and B.M. diagram.

d) A rectangular column 150 mm wide and 100 mm thick carries a load of 150 kN at an eccentricity of 50 mm in the plane bisecting the thickness. Find maximum and minimum intensities of stress in the section.

Marks

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

a) Draw shear force and bending moment diagram for the beam as shown in Fig. No. 1.

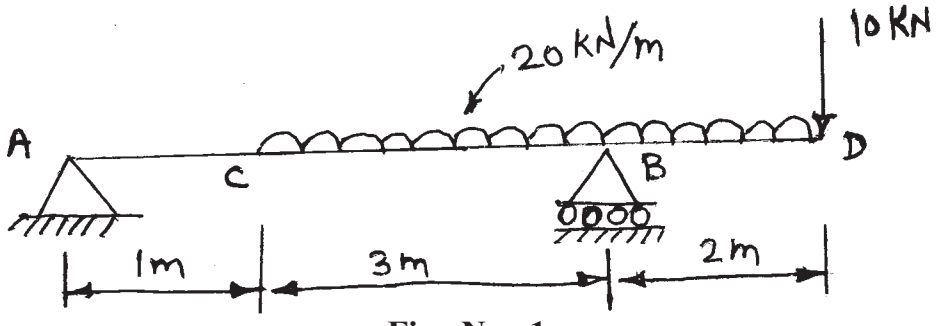

Fig. No. 1

b) A cantilever beam of rectangular metal cross section is 4 m in length carries an UDL of 5 kN/m. If permissible bending stress in the material is 5 N/mm^2, determine the size of the section. Assume depth to width ratio = 2

c) A m.s. bar is subjected to a load of 80 kN. The diameter of the bar is 16 mm and its length is 320 mm. Calculate elongation, if E = 196 kN/mm^2. Also calculate change in diameter if μ = 0.28.

d) State Euler's formula and Rankine's formula giving meaning of symbols used in it. State the effective length of column for various end conditions.

e) A simply supported beam of span 'L' carrying an udl of w/unit length over the entire span. Draw SFD and BMD.

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

a) A brass bar having cross sectional area of 1000 mm^2 is subjected to axial force as shown in Fig. No. 2 find the net deformation in the bar. Take E = 1.05 $\times$ 10^5 N/mm^2.

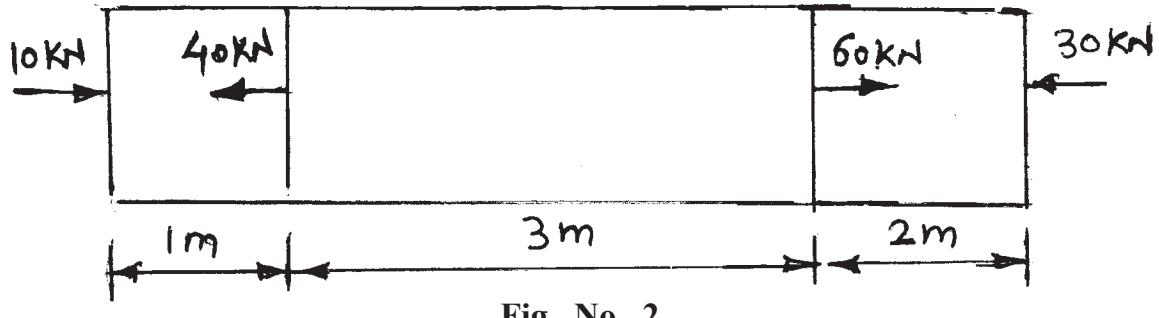

Fig. No. 2

P.T.O.

Marks

b) A T-section flange 160 mm × 20 mm and web 180 mm × 20 mm is simply supported at both the ends. It carries two concentrated loads of 100 kN each acting 2 m from each support. Span of beam is 8 m. Determine maximum bending stress and draw bending stress distribution diagram. Also find bending stress layer 100 mm from bottom.

c) Draw SF and BM diagram for the beam as shown in Fig. No. 3. Also find point of zero shear and maximum B.M.

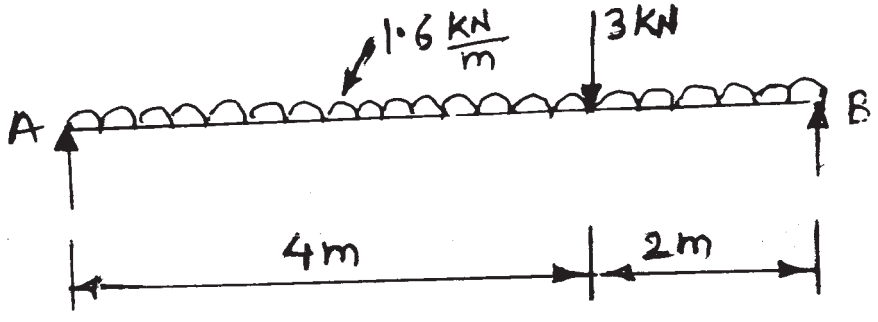

Fig. No. 3

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

a) A rectangular column is 200 mm and 100 mm thick is subjected to a load of 180 kN at eccentricity of 100 mm in plane bisecting the thickness. Draw the combined stress distribution diagram showing their values.

b) A timber beam 100 mm wide and 150 mm deep supports a udl over a span of 2 m. If the safe stress are 28 N/mm^2 in bending and 2 N/mm^2 in shear, calculate the maximum load which can be supported by the beam.

c) Determine the MI of unsymmetrical I-section having following details :

Top flange	160 mm × 12 mm
Bottom flange	240 mm × 12 mm
Web	200 mm × 10 mm