22306

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

(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:

i) Moment of Inertia

ii) Radius of Gyration.

b) Write equation showing relation between three moduli and write meaning of each term.

c) Define temperature stress and temperature strain.

d) Define point of contraflexure.

e) Draw shear stress distribution diagram for rectangular cross section and symmetrical I section.

f) State condition of No Tension at base of column.

g) Write torsional formula and write meaning of each term.

P.T.O.

Marks

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

a) State with neat sketch parallel axis theorem of moment of inertia.

b) Draw stress strain diagram with all limit on it and explain factor of safety for ductile material and brittle material.

c) For certain material, modulus of elasticity is 170 MPa, if poisson's ratio is 0.32. Calculate modulus of rigidity and bulk modulus.

d) A simply supported beam of span 6 meter a udl 3N/m over entire span 2 m from left hand support and 6N point load acting at 2m from right hand support. Draw SFD and BMD.

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

a) A circular disk has diameter 80 mm. Calculate moment of Inertia about it's centroidal axis and MI about its tangent.

b) A brass bar as shown in Figure No. 1 is subjected to tensile force of 40 kN. Find the total elongation of bar if, $E = 1.0 \times 10^5$ N/mm^2 and maximum stress induced.

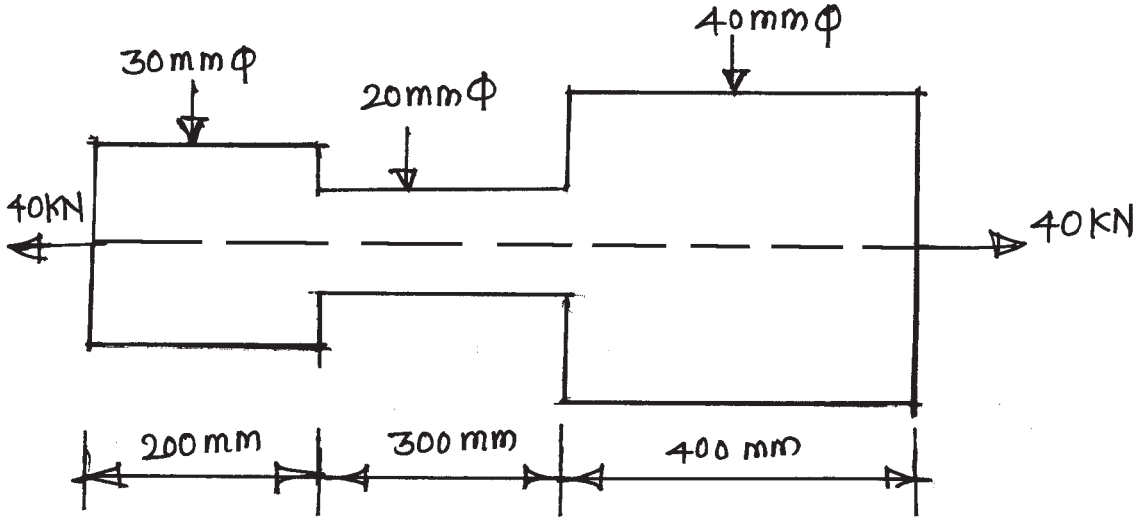

Fig. No. 1

c) A cantilever beam of span 4m carries three point load of 4kN, 3kN and 2kN at 1m, 3m and 4m from fixed end. Draw SFD and B.M. diagram.

Marks

d) A 30 mm diameter rod is bent up to form an offset link as shown in Figure No. 2 If allowable stress in the bar is 80 MPa Determine the maximum value force 'P'.

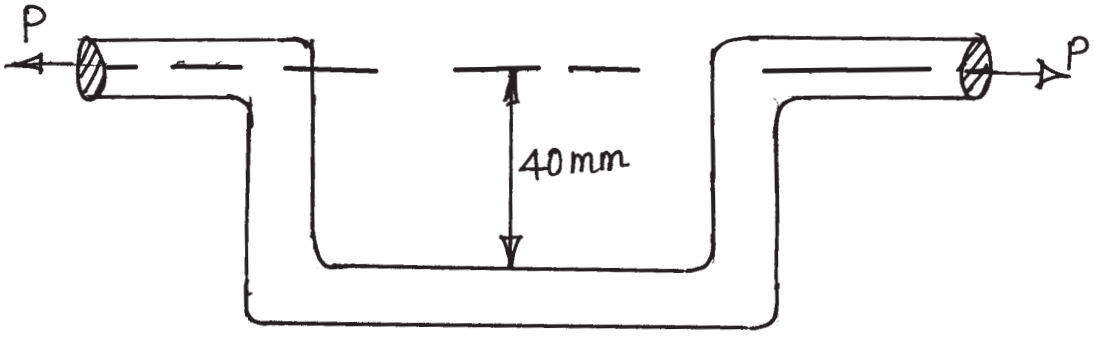

Fig. No. 2

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

a) A simply supported beam of span 4 m carries two points load of 5 kN and 7 kN at 1.5 m. and 3.5 m from the left hand support respectively. Draw SFD and BMD.

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

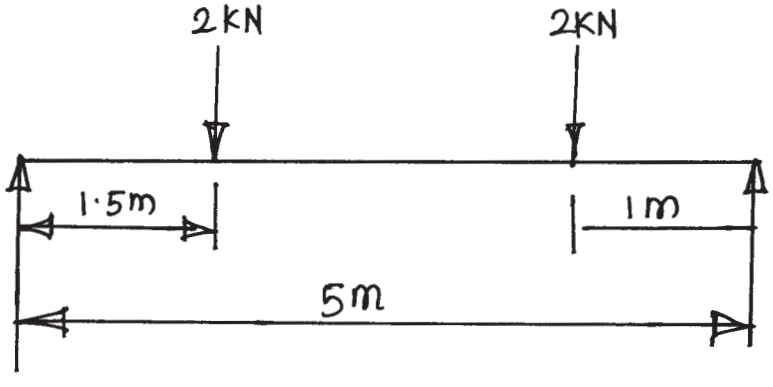

Fig. No. 3

c) A solid circular shaft 40 mm diameter rotating at 200 rpm. Find power that can be transmitted if max. shear stress is not to exceed 85 MPa.

d) A bar 2 m long and 25 mm in diameter is subjected to an axial load of 40 kN applied suddenly. Calculate instantaneous stress and deformation. Assume $E = 2 \times 10^5$ MPa.

P.T.O.

Marks

e) A simply supported beam 8 m span carries a point load 60 kN at center of span. Calculate modulus of section required, if bending stress is not to exceed 150 MPa.

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

a) Select the suitable dia of solid circular shaft to transmit 200 HP at 180 rpm. The allowable shear stress is 80 MPa and angle of twist 1° in length of 3 m. Take G = 0.82×10^5 MPa.

b) State any four assumption in theory of pure bending. Using bending stress equation determine max. bending stress developed in rectangular section 50 × 150 mm when bending moment 600 N.m. is applied about X-X axis.

c) A short column of external diameter 40 cm and internal diameter 20 cm carried eccentric load 80 kN. Find greatest eccentricity which load can have without producing No-tension on the cross section.

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

a) A brass bar having cross section area 1000 mm^2 is subjected to axial forces as shown in Figure No. 4. Find net deformation in bar. Take E = 105×10^5 N/mm^2.

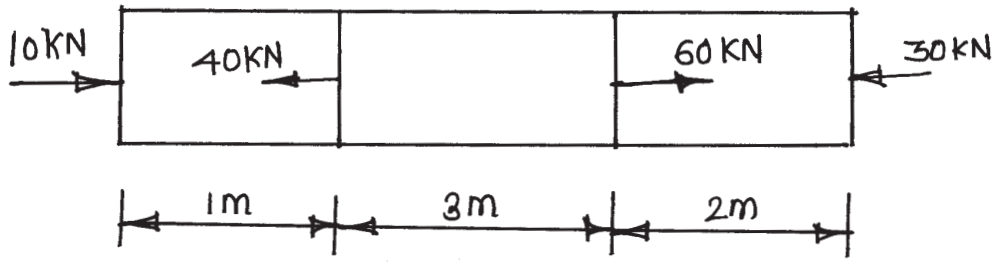

Fig. No. 4

b) A hollow rectangular beam section square in size having outer dimension 120 mm × 120 mm with uniform thickness of material 20 mm is carrying a shear force 125 kN. Calculate max. shear stress induced in section.

c) A diamond shaped pier with diagonal 3 m and 6 m is subjected to an eccentric load 1500 kN at distance 1 m from centroid and on longer diagonal. Calculate maximum stress induced in section.