22306

23124

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 Intertia

ii) Radius of Gyration.

b) What are temperature stresses? How are they produced?

c) State the relation between Young's modulus and Bulk modulus.

d) In case of simply supported beam, State the point at which B.M. is maximum, when it carries full span of U.D.L.

e) Write the equation of section modulus for hollow circulars section.

f) What is the condition for no tension in section?

g) What is core or kernel of section?

Marks

2. Attempt any THREE of the following: 12

a) Calculate the moment of inertia of a hollow rectangle about an axis passing through base 200 mm size. The internal dimension and external dimensions of rectangle are 160 mm × 260 mm and 200 mm × 300 mm respectively.

b) Draw stress-strain curve for ductile material showing salient points on it. Also, define yield stress and ultimate stress on it.

c) Define Poisson's ratio and state the relation between three elastic constants E, G and K.

d) Draw S.F.D. & B.M.D. for a simply supported beam as shown in Fig. No. 1

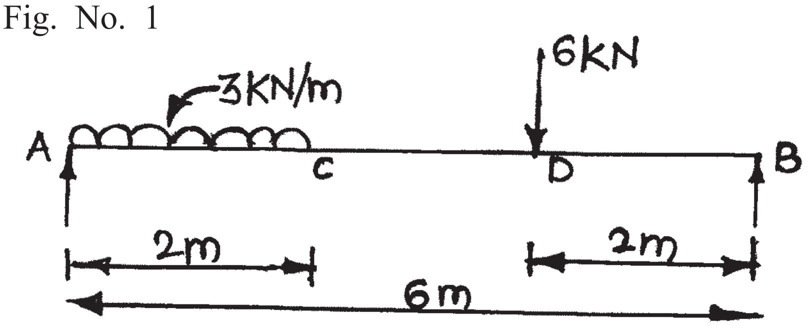

Fig. No. 1

3. Attempt any THREE of the following: 12

a) A hollow circular section with 200 mm external and 100 mm internal diameter. Using parallel axis theorem calculate M.J. about any of its tangent.

b) For a certain material, E = K. Calculate E/G & Poisson's ratio.

c) Draw S.F.D. and B.M.D. for a beam as shown in Fig. No. 2.

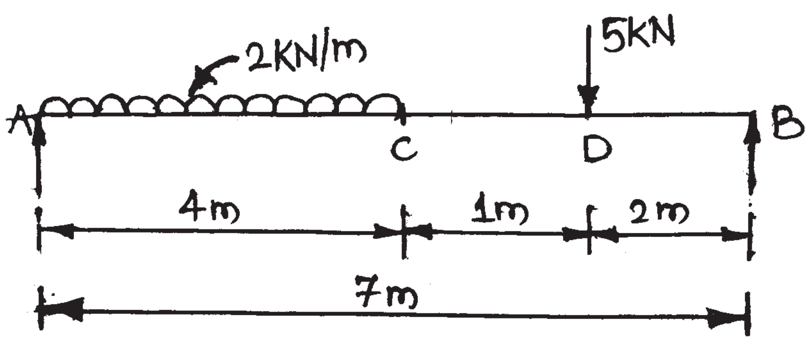

Fig. No. 2

Marks

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 6_{max} and 6_{min}.

4. **Attempt any <u>THREE</u> of the following:** **12**

a) Draw S.F.D. and B.M.D. for the beam as shown in Fig. No. 3

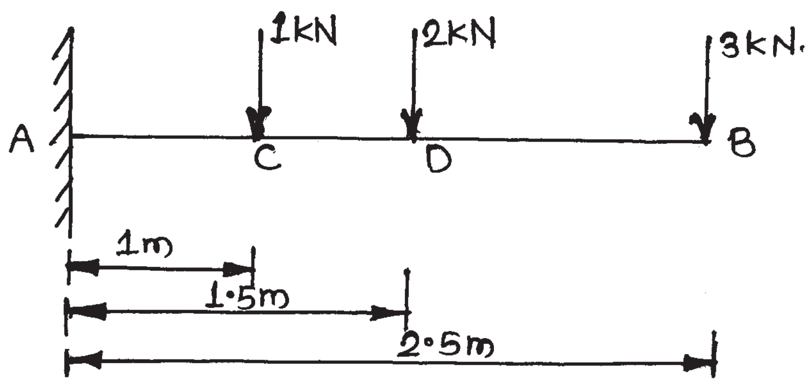

Fig. No. 3

b) A simply supported beam of span 3 m carries a udl of 1000 N/m throughout the span. Calculate the modulus of section if the allowable bending stress for the material is 9 Mpa.

c) A Shaft of 3 m length and 75 mm diameter is fixed at one end and twisted at free end by a force of 2 KN acting at mean radius of 0.6 m. Find the angle of twist. Assume G = 90×10^3 N/mm^2.

d) A steel rod 4 m long and 20 mm diameter is subjected to an axial tensile load of 45 KN. Find the change in length and diameter of rod. Take $E_S = 2 \times 10^5$ N/mm^2 and $\mu = 0.25$.

e) Two shafts of same material are subjected to same torque. If first shaft is solid and the other one is hollow having inner diameter equals to 0.66 times its outer diameters. Compare the weights of two shafts.

Marks

5. Attempt any TWO of the following: 12

a) A m.s. square bar of cross section 10 mm × 10 mm is subjected to forces as shown in Fig No. 4. Calculate the change in length of bar. Take E = 200×10^3 N/mm^2.

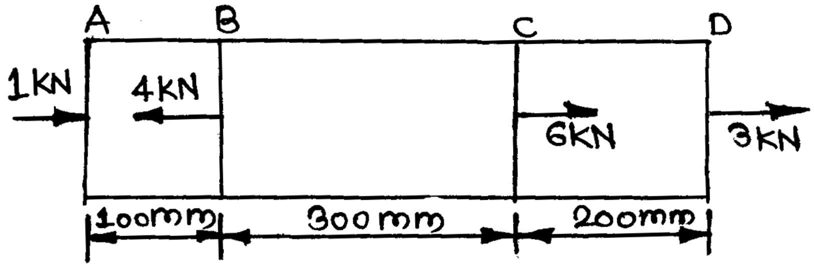

Fig. No. 4

b) Draw S.F.D. and B.M.D. for the beam as shown in Fig. No. 5 and show point of contra flexure if any.

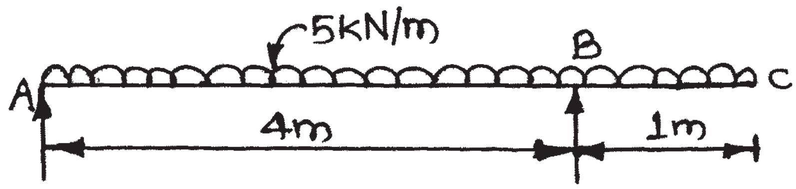

Fig. No. 5

c) A cantilever beam is 2 m long and subjected to udl of 2 KN/m. The cross section of beam is 'T' section. with flange of 80 mm × 10 mm and web of 10 mm × 120 mm. such that its total depth is 130 mm. Determine maximum tensile and compressive load stresses.

Marks

6. Attempt any <u>TWO</u> of the following: 12

a) A hollow rectangular section of 40 mm × 80 mm in inside dimensions and 60 mm × 120 mm outside dimensions subjected to shear force of 50 KN. Draw shear stress variation diagram and find the maximum shear stress induced in the section.

b) Determine the safe diameter of solid shaft which transmits 500 kw at 100 rpm. The values of shear stress and angle of twist should not exceed than 100 N/mm^2 and 1º in 1.5 m length respectively. Take maximum torque as 40% of average torque.
Take $G = 8.5 \times 10^4$ N/mm^2.

c) A short column of hollow circular cross section having 250 mm outside and 150 mm inside diameters, carries a vertical load of 390 KN at an eccentricity of 95 mm from central axis of column. Find the maximum and minimum values of stresses and state their nature.