12526

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 answer 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) State perpendicular axis theorem of moment of Inertia.

b) Define shear strain and modulus of elasticity.

c) State relation between shear force and bending moment.

d) State any four assumptions in theory of pure bending.

e) Define axial load and eccentric load.

f) Draw shear stress and bending stress distribution diagram for hollow rectangular beam section.

g) Define radius of gyration.

Marks

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

a) State the parallel axis theorem with mathematical formula.

b) 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.

c) A simply supported beam of span 5 m carries two point loads of 5 kN and 7 kN at 1.5 m and 3.5 m from the left hand support respectively. Draw S.F.D. and B.M.D. showing the important values.

d) A bar 500 mm long and 22 mm in diameter is elongated by 1.2 mm under the effect of axial pull of 105 kN. Calculate the intensities of stress, strain and the modulus of elasticity of the bar.

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

a) A simply supported beam of span 9.75 m is carrying full span u.d.l. of 10 kN/m. What is the magnitude and position of maximum bending moment developed?

b) A simply supported beam of span 6 m carries a u.d.l. of 3 kN/m spread over 2 m from left support and a point load of 6 kN at 4 m from left support. Draw S.F.D. and B.M.D.

c) An Angle section 120 mm × 100 mm × 20 mm is placed such as its longer leg is horizontal. Calculate M.I. about centroidal horizontal axis only. (i.e. I_{xx} only)

d) A hollow circular section having 200 mm external diameter and 100 mm internal diameter. Calculate the moment of the section about any of the tangent. Also find polar moment of inertia.

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

a) Define :–

   i)   Normal stress

   ii)   Direct stress

   iii) Bending stress

   iv) Shear stress.

b) Sketch the shear distribution diagram for a rectangular beam of 600×200 mm (deep) subjected to a shear force of 20 kN.

c) State the Rankin's formula with meaning of each team used in it.

d) Calculate minimum diameter of steel wire to lift a load of 8.2 kN, if the permissible stress in wire is 120 MPa.

e) Draw S.F. and B.M. diagram for a simply supported beam of span L carrying central point load W. State the value of maximum S.F. maximum B.M.

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

a) Draw stress-strain curve for ductile material and explain the following terms :–

   i)   Elastic limit

   ii)   Upper yield point

   iii) Ultimate load point

   iv) Breaking load point.

b) A rectangular beam section 300 mm wide and 500 mm deep is simply supported over a span of 4 m. It carries a full span uniformly distributed load of 10 kN/m. Find the maximum bending stress induced in the section. Draw the bending stress distribution diagram.

c) A solid circular column of diameter 150 mm carries a vertical load of 50 kN at outer edge of the column. Calculate 6 max and 6 min.

Marks

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

a) A simply supported beam of span 7 m carries a udl. of 2 kN/m over 4 m length from the left support and a point load of 5 kN at 2 m from the right support. Draw S.F. and B.M. diagrams.

b) A cantilever beam of solid circular cross-section and 3 m long carries a concentrated load of 35 kN at its free end, if the maximum bending stress in tension or compression is not to exceed 125 N/mm^2, determine the diameter of the beam.

c) A C.I. hollow circular column has external diameter of 250 mm and internal diameter of 200 mm. It is subjected to a vertical load of 20 kN at a distance of 400 mm from the vertical axis of the column. Calculate the maximum and minimum stress of the base of column.

————