November 2022

<u>Time – Three hours</u>
(Maximum Marks: 100)

[N.B.   1.   Answer all questions under Part-A each question carries 3 marks.

2.   Answer all the questions either (A) or (B) in Part-B each question carries 14 marks.]

PART – A

1.   Write any six mechanical properties of materials.

2.   Define the terms Rigidity and Elasticity.

3.   What are the types of loads? Explain briefly any two of them.

4.   Write the different types of supports.

5.   Define symmetry and anti-symmetry sections.

6.   Write the expression for the centroids of semicircular and quadrant sections.

7.   Define bending stress and what are the types of bending stress.

8.   Define the term bending stress. Sketch bending stress diagram for cantilever and simply supported beam.

9.   What is meant by Bow's notation?

10.   List down the steps involved to obtain graphical solution of a perfect frame.

PART – B

11. (a) (i) A rod 1m long and 20mm x 20mm in cross section is subjected to a pull of 98kN. If the modulus of elasticity of the material is 0.2 x 10⁶ N/mm². Determine the elongation of the bar.

    (ii) A Rectangular wooden column of length 3m and 300mm x 200mm carries an axial load of 300 kN. The column is found to be shortened 1.5mm under the load. Find the stress, strain and Young's modulus.

(Or)

   (b) A Circular rod of diameter 10mm and length 200mm elongates 0.50 mm under an axial load of 50kN. If the change in diameter is 0.01mm. Calculate the values of young's modulus, modulus of rigidity, Poisson's ratio and Bulk modulus.

12. (a) (i) Explain briefly the different types of supports provided for the beams.

    (ii) Construct the SF and BM diagram for the cantilever beam of span 5m loaded with uniformly distributed load of 15 kN/m over the half of the span from the free end. Find the support reaction also.

(Or)

   (b) A cantilever beam of length 1.5 m is loaded over its middle 500mm with an udl of 10kN/m. Draw SFD and BMD.

13. (a) (i) Draw any three symmetrical sections and show their centroidal positions.

    (ii) Find the Centroid of the L –Section, the large leg being 100 X 20mm and short leg being 60 X 20mm.

(Or)

   (b) (i) Draw any three built-up structural sections and show their centroidal positions.

    (ii) Find the centre of gravity of the L-section of size 100mm x60mm x20mm.

14. (a) (i) Define moment of resistance of beam and state its importance.

(ii) A steel wire of 6mm diameter is bent into a circular shape of 5m radius. Determine the maximum stress induced in the wire. Take $E=2\times10^5 N/mm^2$. Also determine the resisting moment offered by the wire while bending.

(Or)

(b) (i) Define the term bending stress. Draw a typical bending stress distribution diagram for a beam.

(ii) A steel flat of 200×20mm is bent into a circular arc of 15m radius. Find the maximum intensity of stress induced. Take $E=2\times10^5 N/mm^2$.

15. (a) Determine the magnitude and nature of forces in the members of truss shown in figure by method of joints.
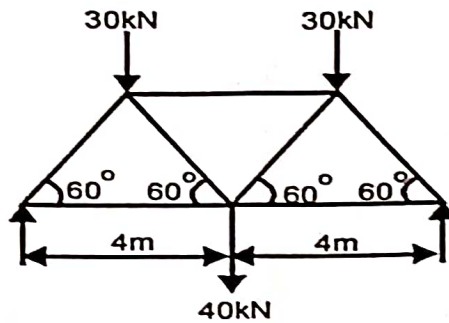
(Or)

(b) Determine the magnitude and nature of forces in the members of truss shown in figure by Graphical method.