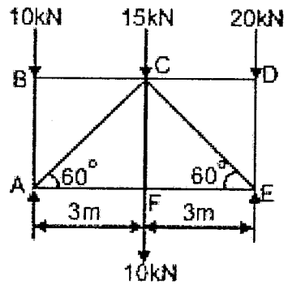
(b) (i) Define shafts. What are the types of shafts? (4)

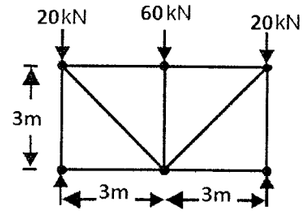
(ii) A hollow shaft has external and internal diameters of 250mm and 200mm respectively is transmitting power at 120 rpm. The maximum torque is 20% more than the mean torque. Find the power transmitted by the shaft, if the shear stress is not to exceed 70 N/mm^2. (10)

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



(Or)

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



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712 Register No.: [ ]

April 2024

Time – Three hours
(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. Define the terms Rigidity and Elasticity.
2. Draw the Stress-Strain curve for a mild steel specimen loaded up to failure and mark the salient points.
3. Draw the diagrammatic representation of different types of supports.
4. Sketch the SFD and BMD of a cantilever beam, when it carries an udl of "w" kN/m over the entire span.
5. Write the expression for the centroid of trapezoidal sections.
6. Define Radius of Gyration.
7. A rectangular beam of size 50mm x 100 mm is subjected to a central point load of 10kN on a simply supported beam of span 5m. Find the maximum bending stress.
8. Define Torsional Rigidity.
9. What is meant by deficient frame?
10. What is meant by Bow's notation?

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PART – B

11. (a) (i) A rod 1m long and 25mm x 25mm in cross section is subjected to a pull of 120kN. If the modulus of elasticity of the material is 0.2×10^6 N/mm^2, determine the elongation of the bar. (7)

(ii) A rectangular wooden column of length 3.5m and cross section of 300mm x 250mm carries an axial load of 325kN. This column is found to be shortened 1.5 mm under the load. Find the stress, strain and Young's modulus. (7)

(Or)

(b) (i) Determine the Poisson's ratio and bulk modulus of material for which Young's modulus is 1.2×10^5 N/mm^2 and modulus of rigidity is 4.5×10^4 N/mm^2. (7)

(ii) A steel bar of 20mm diameter and 2m long is suspended vertically and it is axially loaded with a tensile force of 40kN.Determine the elongation due to self weight. Take E = 2×10^5 N/mm^2 and self-weight of steel is 78000 N/mm^3. (7)

12. (a) (i) Explain the different types of loads acting on beams. (4)

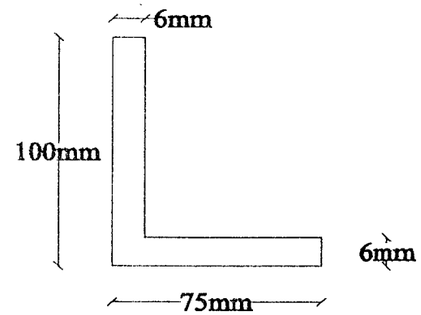
(ii) A cantilever beam of 5m length is loaded with point loads of 2kN, 3kN and 5kN at a distance of 2m, 4m and 5m from fixed end respectively. Construct SFD and BMD. (10)

(Or)

(b) A simply supported beam of 7m span carries a point load of 60kN at 2.5m from the left support and an UDL of 20kN/m for a length of 3.5m from the right support. Draw the SFD and BMD.

13. (a) (i) Write the expression for the centroids of semi-circular and quadrant sections. (7)

(ii) Locate the centroid of an angle section as shown in figure. (7)



(Or)

(b) Calculate the moment of inertia of the I-Section about XX and YY axes having the following details:

Top flange: 150mm x 15mm,

Web: 220mm x 15mm,

Bottom flange: 150mm x 15 mm.

14. (a) A simply supported beam of 6m span carries a point load of 40kN at its centre. Its cross section is a rectangular of breadth 300mm and depth 400mm. Determine

(i) The maximum bending stress. (7)

(ii) The bending stress at fibre 40mm above the neutral fibre. (7)

(Or)

[Turn over.....