Register No.:

542

April 2023

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.
3. Assume suitable values if required.

PART – A

1. State conditions of static equilibrium.

2. Define the terms Hardness and Toughness.

3. List the different types of beams based on support condition.

4. What is meant by statically determinate beam? Give an example.

5. Mark the centroid of the following sections - Semi circular, triangle and Trapezoidal.

6. Define section modulus. What is the value of section modulus of a circle whose diameter is d?

7. Write the stiffness equation and strength equation.

8. What is meant by torque? Draw the shear stress distribution for a circular section.

9. What are the assumptions made in the analysis of frame?

10. What are zero-force members? How do you identify zero-force members?

[Turn over...

PART – B

11. (a) (i) A steel wire of 1 m long and 3 mm diameter elongated by 0.08mm in length and contracted by 3 x 10^{-5} mm in diameter under a tensile load of 200N. Calculate stress, linear strain, lateral strain and Poisson's ratio and Young's modulus. (7)

(ii) A steel rod 25 mm diameter and 2m long is subjected to an axial pull of 50 kN. Find, (a) The intensity of stress (b) Strain (c) Elongation. Take E = 200 GN/m^2 (7)

(Or)

(b) A bar 400mm long,40mm square in section for the first 190mm length,25mm diameter for the next 120mm length and 35mm x 30mm rectangular in section for the remaining length is subjected to an axial tension of 120kN. Find the maximum and minimum stresses induced in the bar. Also calculate the total elongation. Take E=2x10^5 N/mm^2

12. (a) (i) Sketch the Shear force diagram and bending moment diagram of cantilever beam subjected to uniformly distributed load 'W' throughout the span. (7)

(ii) Construct the SF and BM diagram for the cantilever beam of length 4m loaded with uniformly distributed load of 3 kN/m throughout the span. Find the support reaction also. (7)

(Or)

(b) A simply supported beam of span 5m carries an udl of 10kN/m for the left half of span and a point load of 40kN at 2m from the right support. Draw the SFD and BMD.

13. (a) (i) A T section has a flange width of 120mm and thickness of 20mm.The web is 100mm deep and 20mm thick. Locate the centre of gravity. (7)

(ii) Find the centre of gravity of an inverted T section with flange 50mm x 10mm and web 60mm x 10mm. (7)

(Or)

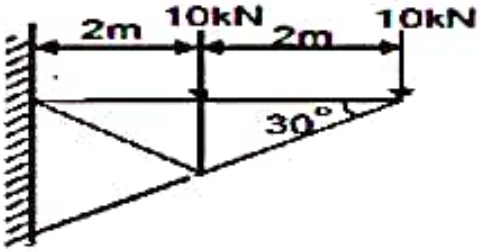
(b) (i) State the perpendicular axis theorem. (4)
(ii) Find the moment of inertia of I section 100 x 75 x 6mm about centroidal axes xx and yy. (10)

14. (a) (i) State the assumptions made in the theory of simple bending. (4)
(ii) A cantilever beam of rectangular section 200mm x 300mm is 3m long. It is loaded with 5kN/m over the entire span. Determine (a) maximum moment of resistance of the beam and (b)the concentrated load that can be placed at the free end of the cantilever in addition to the udl, if the bending stress is not to exceed 10N/mm^2. (10)

(Or)

(b) (i) Derive the formula for power transmitted by a shaft.(7)
(ii) A solid shaft of 10mm diameter and 4m long is subjected to twisting moment which produces maximum shear stress of 60 N/mm^2. Determine the angle of twist in degrees. Take G=0.8x10^5 N/mm^2. (7)

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.