1027

Code : 15CE-31T

Register Number

ENGINEERING MECHANICS AND STRENGTH OF MATERIALS

Time : 3 Hours] | Max. Marks : 100

Note :   Answer any **six** questions from Part-A, and **Seven** questions from Part-B.

PART – A

1. Differentiate between coplanar and non-coplanar force system with neat sketches.   **5**

2. Define the following terms :   **5**

    (a)   Ductility

    (b)   Resilience

    (c)   Creep

    (d)   Fatigue

    (e)   Endurance

3. Find the centroid of a T-section with a flange of 150 × 50 mm, web of 50 × 150 mm.   **5**

4. Give the classification of beams with sketches.   **5**

5. Draw SFD and BMD for a cantilever beam, which carries two point loads of 5 kN and 2 kN @ a distance of 2 m and 4 m respectively from fixed end. The length of beam = 4 m.   **5**

6. What are the assumptions made in theory of simple bending ?   5

7. Derive an equation for section modulus of a rectangular section.   5

8. A cantilever beam 2.4 m long carries a point load of 30 kN at its free end, find the slope of the beam, under the load. Take flexural rigidity for the beam section 20×10^{12} N-mm^2.   5

9. Define column, write the Euler's crippling load formula for different end conditions.

PART – B

10. Fig. shows four forces acting at a point, determine the magnitude and direction of the resultant force.   10
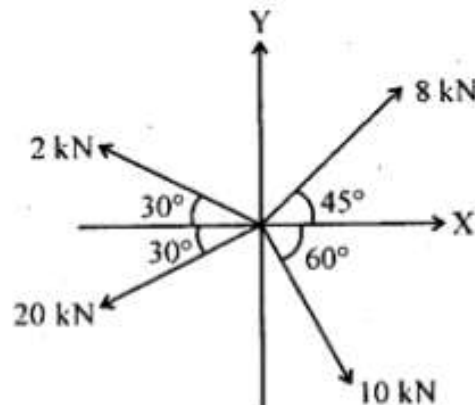
11. A rod when subjected to an axial load develops a longitudinal strain of 0.0025 and lateral strain of 0.00075 and a stress of 500 N/mm^2. Calculate, Young's modulus, Poisson's ratio, modulus of rigidity and bulk modulus.   10
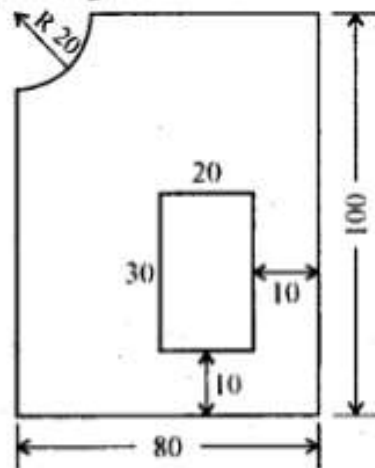
12. An axial pull of 30 kN is acting on a bar consisting of three lengths, as shown in fig. if $E = 2.1 \times 10^5$ N/mm². Determine the stresses in each section and the total elongation of bar.   **10**
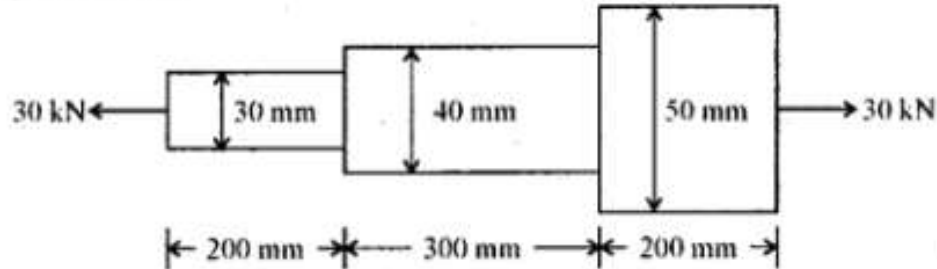
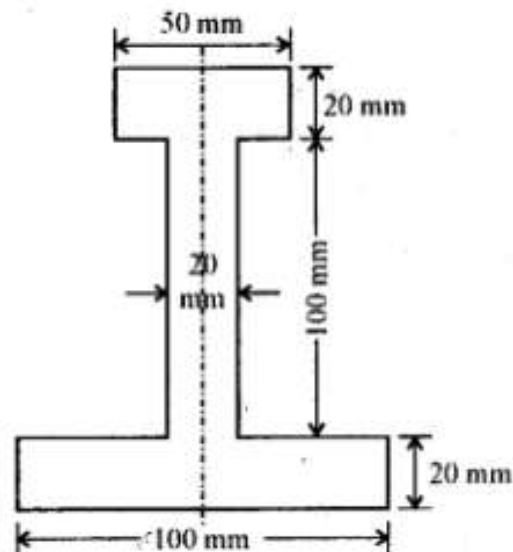13. Find the centroid of the plane figure shown.   **10**

All dimensions are in mms

14. Find the M.I. of I-Section shown in figure, about the horizontal axis passing through the centroid.   **10**

15. A simply supported beam of 7 m carries a udl of 5 kN/m over 4 m length from the left support and a point load of 40 kN at 2 m from right support, draw SFD and BMD. 10

16. Draw SFD and BMD for a single over hanging beam of span 2 m, with a overhanging portion of 1 m, on right side, carries a udl of 2 kN/m over entire beam, with a point load of 1 kN at free end. 10

17. A simply supported beam has a span of 6 m carrying udl of 3 kN/m over entire span. If the maximum bending stress not to exceed 10 N/mm². Calculate the width and depth of beam.

Take depth of beam is twice of its width. 10

18. A beam 4 m long simply supported at its ends carries a point load of 10 kN at its centre. It the slope at the ends of the beam not to exceed one degree, find the deflection at its centre. 10

19. An alloy tube 4 m long extends 6 mm under a tensile load of 50 kN. Calculate the safe load with a factor of safety of 04 for a tape, when it is used at strut with both ends being fixed. The inner and outer diameter of this tube is 25 mm and 40 mm respectively. 10