

231

October 2014

Time – Three hours
(Maximum Marks: 75)

- [N.B: (1) Answer any fifteen questions in PART - A and division (A) or division (B) of each question in PART - B.
(2) Each question carries 1 (one) mark in PART - A and 12 (twelve) marks in PART - B.]

PART – A

1. Name the three types of stresses.
2. State Hooke's law.
3. Mention the Young's modulus value of mild steel and timber.
4. Define the term working stress.
5. Mention the difference between uniformly distributed load and uniformly varying load.
6. State any one static equilibrium equation.
7. Write the sign convention used for SF.
8. Write the maximum BM value in case of cantilever beam with UDL throughout the span.
9. What do you mean by symmetrical section?
10. Sketch and mark the centroidal position of semi-circular section.
11. Define the term radius of gyration.
12. Write the expression for MI of hollow rectangular section about its centroidal axes.
13. What are bending stresses?
14. What is the position of NA and centroidal axis due to bending of beams?
15. Write down the equation of torsion.
16. Define the term Torsional modulus.
17. Mention the classification of frames.
18. How do you decide the nature of forces in the members of trusses?
19. What are zero-force members?
20. What do you mean by vector diagrams?

PART – B

21. (A) (i) Define the following terms: Hardness, Ductility and Brittleness. Marks
3

[Turn over.....

- (ii) A reinforced concrete column 500mm x 500mm in section is reinforced with 4 steel bars of 25mm diameter one in each corner. The column is carrying a load of 2000kN. Find the stresses in concrete and steel. Take $E_s = 2.1 \times 10^5 \text{ N/mm}^2$ and $E_c = 1.40 \times 10^4 \text{ N/mm}^2$. 9

(Or)

- (B) A bar of 30mm diameter is subjected to a pull of 60kN. The measured extension on a gauge length of 200mm is 0.10mm and change in diameter is 0.004mm. Calculate (i) Young's modulus, (ii) Poisson's ratio, (iii) Bulk modulus and (iv) Change in volume. 12

22. (A) (i) Define the terms: shear force and bending moment. 3
 (ii) Draw the SFD and BMD for the cantilever beam shown in Figure 1. 9

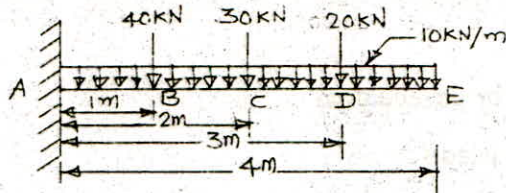


FIG. 1

(Or)

- (B) Draw the SFD and BMD for the overhanging beam shown in Figure 2. 12

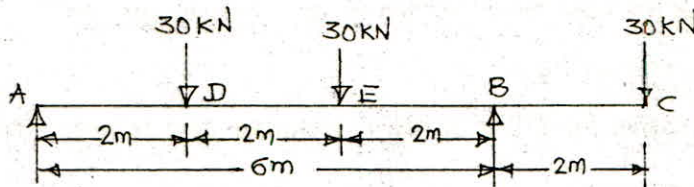


FIG. 2

23. (A) (i) Locate the centroid (\bar{x} and \bar{y}) of trapezoidal section shown in Figure 3. 8

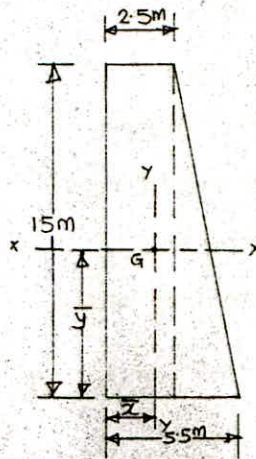


FIG. 3

- (ii) Derive the moment of inertia and section modulus of a hollow circular section. 4

(Or)

- (B) Determine the moment of inertia of an angle section 150mm x 100mm x 20mm (150mm vertical) about xx and yy axes. 12

24. (A) (i) Define the following terms: Neutral axis and Moment of resistance. 3
 (ii) A simply supported timber beam is 6 metres long. It carries an UDL of 15kN/m over the entire span and a concentrated load of 20kN at mid span. The stress in the beam is not to exceed 8N/mm^2 . Design a suitable section by assuming the depth as twice the breadth. 9

(Or)

- (B) The internal and external diameters of a hollow shaft are 200mm and 250mm respectively. It is transmitting power at 120rpm. 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 70N/mm^2 . 12

25. (A) Determine the magnitude and nature of forces in the members of truss shown in Figure 4 by method of joints. 12

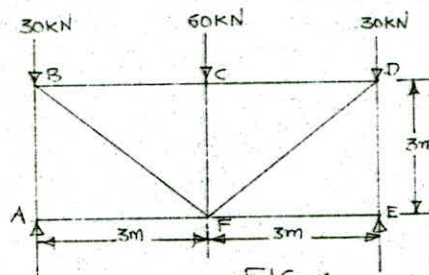


FIG. 4

(Or)

- (B) Determine the magnitude and nature of forces in the members of truss shown in Figure 5 by graphical method. 12

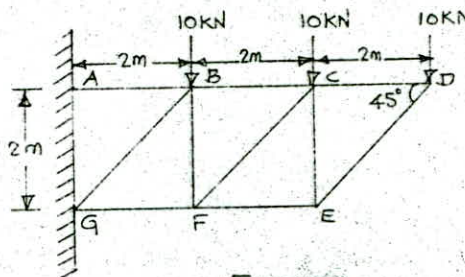


FIG. 5

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