

OCTOBER 2021

Time: Three hours

Maximum Marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
 2. Answer any ONE question from each unit in PART-B (3 marks each)
 3. Answer any ONE question from each unit in PART-C (10 marks each)
 4. The question paper contains TWO Pages

PART-A (1x10=10)

1. What is brittleness?
2. Define the term: 'bulk modulus'.
3. What is the unit of bending moment?
4. What do you mean by point of contraflexure?
5. Draw any one built-up section.
6. What is polar moment of inertia?
7. What is torque?
8. Write the strength equation.
9. What is perfect frame?
10. What is tie member in frame?

PART-B (3x5=15)

UNIT-I

11. Define the terms: Lateral strain and volumetric strain.
12. Draw and explain the stress-strain curve for ductile material.

UNIT-II

13. Sketch the SFD and BMD of the simply supported beam of length 4m, when having a point load of 100kN at the mid span.
14. What is shear force and bending moment?

UNIT-III

15. What is symmetrical section and draw any three symmetrical sections?
16. What is parallel axis theorem?

UNIT-IV

17. What are the assumptions made in the theory of simple bending?
18. Which type of shaft is more advantageous and why?

UNIT-V

19. What do you mean by the term 'resolution of forces'?
20. What is space diagram and vector diagram?

UNIT-I

21. A bar of length 150mm is circular in section and it has uniform diameter of 40mm. The extension in length and contraction in diameter were found to be 0.25mm and 0.03 mm respectively when it is subjected to 400kN. Determine the values of elastic constants.
22. A stepped steel bar is, 600mm long. The two end portions are 30mm and 20mm in diameter and each end portions are 200mm long. The middle portion is 200mm long and 25mm diameter. Calculate the total elongation in the bar if it carries an axial tension of 40kN. Take $E=2.1 \times 10^5 \text{ N/mm}^2$.

UNIT-II

23. Draw SFD and BMD for the given cantilever beam of span 4m carries a point load of 40kN at the middle of the beam in addition with an UDL of 10kN/m runs over 2m from the fixed support.
24. Draw SFD and BMD for the given simply supported beam of span 7m carries an UDL of 5kN/m over the middle of 2m span in addition with two point loads of each 50kN at 2m away from the both supports.

UNIT-III

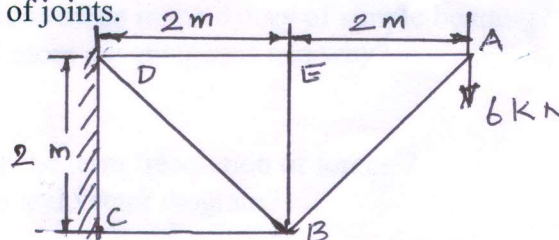
25. Locate the position of centroid and calculate the moment of inertia about both xx-axis and yy-axis for the given 'T' section of overall height 180mm. The size of the flange is 120mmx40mm and the size of web is 140mm x 50mm.
26. A build up section is formed by two channels ISLC 300mmx100mm and two plates of 300mmx20mm placed one at above and another at below the flange of channel. Find the moment of inertia about both xx-axis and yy-axis for the given built-up section. For each ISLC 300mmx100mm section, $I_{xx} = 6048 \times 10^4 \text{ mm}^4$, $I_{yy} = 346 \times 10^4 \text{ mm}^4$, $a=4211 \text{ mm}^2$ and $C_{yy} = 25.5 \text{ mm}$.

UNIT-IV

27. A rectangular wooden beam of 240mmx400mm size is to be replaced by a steel pipe of 200mm outer diameter. Determine the thickness of pipe required if the permissible bending stress in steel and wood are 140 N/mm^2 and 7 N/mm^2 respectively.
28. A solid circular shaft has to transmit a power of 40kW at 120rpm. The permissible shear stress is 95 N/mm^2 . The maximum twisting moment in the shaft will be 25% greater than the mean torque. Determine the diameter of the shaft required.

UNIT-V

29. Determine the forces in the members and their nature for the given cantilever frame shown in the figure by method of joints.



30. Determine the forces in the members and their nature for the given simply supported frame shown in the figure by graphical method.

