



C23-M-304

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**BOARD DIPLOMA EXAMINATION, (C-23)
OCTOBER/NOVEMBER—2024
DME – THIRD SEMESTER EXAMINATION
STRENGTH OF MATERIALS**

Time : 3 Hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Classify the loads based on the criteria of effect produced.
2. A timber specimen of square section 50×50 mm is 200 mm long. It is shortened by 0.3 mm under an axial compression of 40 kN. Determine the modulus of elasticity for the timber material.
3. Draw the stress-strain diagram for the mild steel and name the salient points.
4. Write the expression for the strain energy in usual terms and name each term.
5. Define the terms shear force and bending moment.
6. Draw the shear force and bending moment diagrams for the cantilever beam of span l with point load W at the free end.

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7. Define neutral layer and section modulus in simple bending.
8. A simply supported beam of 1.5 m is subjected to a central point load of 10 kN. Find the deflection of the beam under the load. Take $E = 200 \text{ GN/m}^2$ and moment of inertia $I = 12 \times 10^6 \text{ mm}^4$.
9. Write an expression for power transmission by a shaft and name each term.
10. A close-coiled helical spring is to carry a load of 120 N and the mean coil diameter is 10 times the diameter of the wire. Find the diameter of wire if the maximum shear stress is to be 95 N/mm^2 .

PART—B

10×5=50

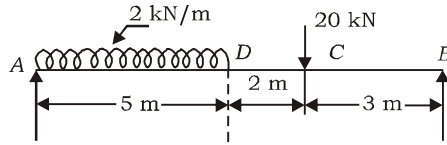
Instructions : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. A m.s bar has a diameter of 10 mm and is 350 mm long. A tensile load of 15 kN is applied longitudinally. Calculate the extension of the bar, the change in diameter and change in volume. Assume $E = 2 \times 10^5 \text{ N/mm}^2$ and the Poisson's ratio is 0.25.
12. A steel rod of length 1.5 m is of diameter 75 mm over a portion of 0.5 m long and of diameter 45 mm over the remainder. Calculate the strain energy in the rod when it is subjected to an axial load of 60 kN. $E = 200 \text{ kN/mm}^2$.
13. A cantilever of 3 m long carries two point loads each 4 kN, one placed at free end and the other at 2 m from fixed end. Draw shear force and bending moment diagrams.

14. Draw shear force and bending moment diagrams for the beam shown in figure below :



15. A cantilever 3 m long and of rectangular section carries a UDL of 20 kN/m over its entire length. If the maximum stress induced is not to exceed 125 N/mm^2 , find the dimensions of the beam. Take depth of section is twice the width.
16. A steel tube 4 m long having external and internal diameters of 80 mm and 50 mm respectively is freely supported at each end and a load of W Newtons acts at a distance of 1.25 m from one end. Calculate W if the maximum bending stress is not to exceed 120 MN/m^2 .
17. Write the necessary assumptions and derive the torsion equation.
18. A solid shaft of 75 mm diameter is to transmit 70 kW at 100 RPM. Find
- Torque
 - Maximum shear stress
 - Angle of twist over a length of 600 mm, and
 - Shear stress at a radius of 30 mm. Assume $G = 0.8 \times 10^5 \text{ N/mm}^2$.

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