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C16-M-302

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BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

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. Define the terms (a) ultimate strength and (b) factor of safety.
2. A mild steel bar carries an axial load of 75 kN. If the allowable tensile stress is 50 N/mm^2 . Find the diameter of the rod.
3. Derive an expression for the strain energy.
4. A seamless pipe 800 mm diameter contains a fluid under a pressure of 2 N/mm^2 . If the permissible tensile stress is 100 N/mm^2 . Find the maximum thickness of the pipe.
- * 5. What are the different types of loads acting on a beam?
6. State the bending moment equation and write the units of each term.
7. Define (a) deflection and (b) slope.
8. State the function of shaft. List suitable materials of shafts.
9. A solid circular shaft of diameter 40 mm. Transmits 1500 N-m torque. Find the shear stress induced in it.
10. List out various types of springs.

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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 copper bar 300 mm long is 30 mm in diameter for 200 mm of length and 20 mm in diameter for remaining length. A tensile load is applied to the bar so that the maximum stress induced in the material is 50 N/mm^2 . Determine the magnitude of load and calculate the total extension of the rod. Take $E = 1.03 \times 10^5 \text{ N/mm}^2$.

12. A MS bar of length 2 m, has a diameter of 50 mm, hangs vertically. A load of 25 kN falls on a collar attached to the lower end. Find the maximum stress (a) height of fall is 100 mm, (b) load is applied suddenly without impact and (c) when the load is applied gradually. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

13. A thin cylindrical shell 100 cm diameter, 1cm thick and 5 m long is subjected to an Internal fluid pressure of 5 N/mm^2 . Calculate (a) hoop stress and longitudinal stress, (b) circumferential strain, (c) longitudinal strain and (d) volumetric strain. Assume $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.3.

14. A 6 m long cantilever carries loads of 2 kN and 3 kN at 2 m and 5 m respectively from fixed end and a UDL of 10 kN/m over its entire length. Draw shear force and bending moment diagrams.

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15. A cantilever 5 m long and of a rectangular cross-section carries a UDL of 25 kN/m . over its entire length. If the maximum stress induced is not to exceed 150 N/mm^2 . Find the dimensions of the beam. Take depth of section is twice the width.

16. A simply supported beam of I section 4 m long, carries UDL of 10 kN/m over the entire span and a concentrated load of 70 kN at mid span. (a) Find the maximum deflection of the beam and (b) find the slope at the ends. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $I = 8.98 \times 10^7 \text{ N/mm}^4$.

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17. Select suitable diameter of solid shaft to transmit 120 kW of power at 240 rpm. If the allowable shear stress is not to exceed 75 N/mm^2 and twist is not to exceeds 1° in a length of 4 m. Take $G = 0.8 \times 10^5 \text{ N/mm}^2$.
18. A helical spring 150 mm mean diameter is required to absorb 40 kJ of energy with maximum shear stress of 450 N/mm^2 . Find the diameter of the steel rod and number of coils. If the maximum amount of compression is 160 mm. Assume $G = 0.8 \times 10^5 \text{ N/mm}^2$.

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