



C16-M-302

6243

BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

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 Hooke's law.
2. Define Poisson's ratio.
3. Derive an expression for strain energy.
4. Define hoop stress and write the relation between hoop stress and longitudinal stress.
5. Explain the following :
 - (a) Shear Force
 - (b) Bending Moment
6. Define section modulus.
7. Define the terms slope and deflection.
8. What is angle of twist?
9. State the function of shaft. List suitable materials for shafts.
10. Define solid length in 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 mild steel bar has a diameter of 45 mm and is 600 mm long. A tensile load of 90 kN is applied longitudinally. Calculate the elongation of the bar, the change in diameter and the change in volume. Take, $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's Ratio as 0.3.
- 12.** The following data refers to a tensile test, (i) diameter of steel bar = 30 mm, (ii) gauge length = 200 mm, (iii) extension at a load of 100 kN = 0.139 mm, (iv) load at elastic limit = 200 kN. Calculate (a) resilience, (b) proof resilience and (c) modulus of resilience.
- 13.** The shell of a boiler is 3 m in diameter and the plates are 20 mm thick. Calculate the safe working pressure in the boiler, if safe working stress for the plate is 70 N/mm^2 and efficiency of joint is 80%.
- 14.** A cantilever beam of length 5 m is loaded with UDL of 12 kN/m upto a length of 2.5 m from fixed end, carries a point load of 18 kN at mid span, and also carries a point load of 25 kN at free end. Draw SF and BM diagrams.
- 15.** A simply supported beam is 250 mm × 400 mm in section and 8 m long. If the permissible bending stress is 120 N/mm^2 , find the (a) point load that can be applied at the centre of the beam and (b) UDL that can be applied on the entire beam.
- 16.** A wooden beam of rectangular cross-section 130 mm wide × 220 mm depth is simply supported at its ends and has a span of 6 m. If the maximum allowable bending stress is 8.0 N/mm^2 , what is the maximum deflection? Take, $E = 0.1 \times 10^5 \text{ N/mm}^2$.

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- 17.** A solid steel shaft has to transmit 75 kW at 200 rpm. Taking allowable shear stress as 70 N/mm^2 , find suitable diameter of the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%.
- 18.** (a) List out the applications of springs.
(b) Draw a neat sketch of a close-coiled helical spring and define the terms spring index and stiffness.

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