



C14-M-305

4252

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2018

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) Answer should be brief and straight to the point.

1. Write about the subject 'strength of materials' deals with.
2. Define lateral strain and Poisson's ratio.
3. Define the resilience and proof resilience.
4. Define the point of contraflexure (inflexion) and shear force.
5. A cantilever beam 6 m long carries a point load of 25 kN at the free end. Draw the shear force and bending moment diagram.
6. Define the neutral layer.
7. Write the formula for deflection of cantilever of length  $l$  carrying a point load  $w$  at the free end with terminology.
8. Write the torsion equation with terminology and units.

/4252

\*

1

[ Contd...

9. Define the following terminology in helical springs :
- (a) Spring index  
(b) Proof load
10. A 900 mm diameter pipe contains a fluid at a pressure of  $2.5 \text{ N/mm}^2$ . If the safe stress in tension is  $100 \text{ N/mm}^2$ , find the minimum thickness of the pipe.

**PART—B**

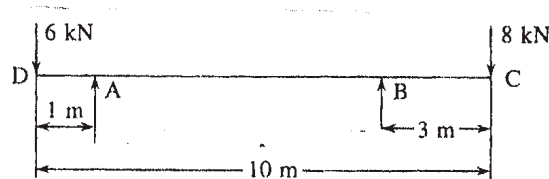
10×5=50

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

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

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

11. An axial pull of 150 kN is gradually applied on a circular steel rod 3 m long and 40 mm diameter. Find the strain energy that can be stored in the rod, if  $E$  for rod material is  $2.0 \times 10^5 \text{ N/mm}^2$ .
12. A bar of 16 mm diameter is subjected to a pull of 27 kN. The measured extension over gauge length of 80 mm is 0.12 mm and the change in diameter is 0.007 mm. Find the Poisson's ratio and the modulus of elasticity.
13. A beam of length of 10 m is simply supported over a span of 8 m and is having 2 m span beyond the right end support. It carries a UDL of 2 kN/m for left half of the beam and a point load of 4 kN at a distance of 10 m from left-hand support. Draw shear force and bending moment diagrams stating the positions of point of contraflexure.
14. (a) Draw shear force and bending moment diagram for the following loaded beam :



- (b) Draw the stress-strain diagram for ductile material and explain.

15. (a) <sup>\*</sup> A timber beam of rectangular cross-section 150 mm wide  $\times$  300 mm deep is simply supported at its ends and has a span of 5 m. The maximum allowable bending stress is  $7.5 \text{ N/mm}^2$ . Find the maximum safe UDL which the beam can carry.
- (b) Find the maximum shear stress induced in a solid circular shaft of diameter 15 cm when the shaft transmits 150 kW power at 180 RPM.
16. A beam of uniform rectangular cross-section 175 mm wide and 250 mm deep is simply supported its ends. It carries uniformly distributed total load of 30 kN over the entire span of 4 m. Find (a) the slope at the supports and (b) maximum deflection. Take,  $E = 1.2 \times 10^4 \text{ N/mm}^2$ .
17. A cylindrical thin drum 800 mm in diameter, 3 m long has a shell thickness of 10 mm. If the drum is subjected to an internal pressure of  $2.5 \text{ N/mm}^2$ , determine (a) change in diameter, (b) change in length and (c) change in volume. Take,  $E = 1.2 \times 10^4 \text{ N/mm}^2$  and Poisson's ratio = 0.25.
18. A helical spring 150 mm mean diameter is required to absorb 30 kJ of energy with a maximum shear stress of  $470 \text{ N/mm}^2$ . Determine the diameter of steel rod and the number of coils if maximum compression is to be 150 mm. Take,  $G = 84 \text{ kN/mm}^2$ .

\*

\*\*\*