* 5488 *

C16–M–302

5488

BOARD DIPLOMA EXAMINATION, (C–16)

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.

1. List out the three elastic constants and write down the relations between them.

2. A rectangular bar 16 mm × 10 mm × 200 mm long. Find the axial load carried by the bar if its extension is 0·12 mm.

Take Young's modulus E 208 GN/m^2.

3. Define the following terms :

(a) Resilience

(b) Proof resilience

(c) Modulus of resilience

4. Draw the shear force and bending moment diagrams of cantilever beam with point load at free end.

5. *(a)* List the types of loads.

(b) Define point of contraflexure.

6. State any three assumptions made in the theory of simple bending.

7. Write an expression for maximum slope and deflection of cantilever beam with a UDL on entire span.

8. Define the term polar modulus of section.

9. Define the terms spring index and stiffness related to coil spring.

10. Define thin cylindrical shell.

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.
(2) Each question carries **ten** marks.

11. Draw a stress-strain diagram for MS specimen and discuss the significance of salient points on it.

12. *(a)* A test bar of certain material 40 mm diameter when subjected to an axial pull of 500 kN recorded an extension of 0·34 mm on a gauge length of 150 mm and decrease of 0·022 mm in diameter. Find the Poissons ratio and three elastic constants.

(b) A cantilever beam of 3 m long carries two point loads each 4 kN, one placed at a free end and the other at 2 m from fixed end. Draw SF and BM diagram.

13. An MS bar of length 2 m and has a diameter of 50 mm, hangs vertically. A load of 20 kN falls on a collar attached to the lower end. Find the maximum stress when *(a)* height of fall is 150 mm, *(b)* load is applied suddenly without impact and *(c)* the load is applied gradually.

Assume Young's modulus of elasticity E 2 10^5 N/mm^2.

14. A beam of length 1·2 m is simply supported at its end carries two point loads of 3·5 kN and 4 kN at distances of 0·4 m and 0·8 m from the left end support. Draw SFD and BMD.

15. A beam of length 5 m has an inverted T-section with 100 mm × 20 mm flange and 100 mm × 20 mm web. It is simply supported at the ends and carries a UDL of 2 kN/m. Calculate the maximum tensile and compressive stresses.

16. A hollow steel shaft transmits 500 kW at 450 r.p.m. The maximum shear stress is 60 N/mm^2. Find the outside and inside diameters of shaft, if the outside diameter is twice that of inside diameter, assuming that the maximum torque is 25% greater than the mean torque.

17. *(a)* 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.

(b) A cantilever 1·25 m long of rectangular section 100 mm × 160 mm carries a concentrated load of 60 kN at free end. Find the deflection at free end. Take $E \quad 2 \quad 10^5$ N / mm^2.

18. Calculate the minimum wall thickness of a thin cylinder 1 m in diameter if subjected to an internal pressure of 2 N/mm^2. The hoop stress should not exceed 40 N/mm^2 and the longitudinal stress not to exceed 30 N/mm^2.

★ ★ ★