* 4253 *

C14–M–305

4253

BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2015

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. A steel bar 20 mm diameter and 2 m long and is subjected to an axial pull of 20 kN. Determine the stress and elongation. Take $E = 2{\cdot}1 \times 10^5$ N/mm^2.

2. Define the following terms :

(a) Poisson's ratio

(b) Factor of safety

3. A 10 mm diameter of steel bar of length 1·6 m is stressed by a weight of 150 N, freely dropping through a height of 20 mm before commencing to stretch the bar. Calculate the instantaneous stress when $E = 1{\cdot}96 \times 10^5$ N/mm^2.

4. List out various types of beams and give examples.

5. A cantilever of 4 m long carries two point loads each 5 kN, one placed at free end and the other at middle of the span. Draw the bending moment diagram.

6. What are the assumptions made in the theory of simple bending?

7. Write the expression for slope and deflection on simply supported beam with UDL over the entire beam.

8. A steel shaft is to transmit torque 100 kN-m if the shearing stress is limited to 45 N/mm^2. Calculate the minimum diameter of the shaft.

9. Define the following terms :

(a) Spring index

(b) Helix angle

10. Calculate the hoop and longitudinal stresses in the material of a thin cylindrical shell of 3 m diameter and 30 mm thickness subjected to an internal pressure of 1·2 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 the criterion for valuation is the content but not the length of the answer.

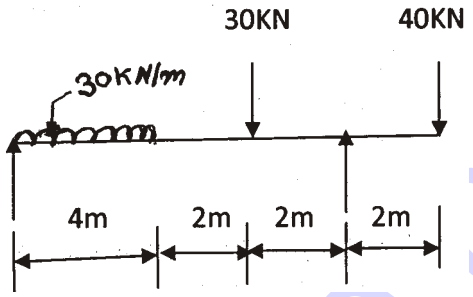
11. A compound tube consists of a steel tube 150 mm internal diameter and 10 mm thicknesses and an outer brass tube 170 mm internal diameter and 10 mm thicknesses. The two tubes of same length of 150 mm and this compound tube carries an axial load of 1000 kN. Assume E for steel as 200 GN/mm^2 and E for brass as 100 GN/mm^2. Find the stresses in each material.

12. A wagon weighing 50 kN is attached to a wire rope and is moving on an inclined track at a speed of 5·4 kmph and the wagon is suddenly brought to rest. If the length of the rope is 60 m at the time of sudden stoppage, calculate the maximum instantaneous stress and elongation produced in the rope.

13. *(a)* A hollow steel column of external diameter 300 mm has to support an axial load 2500 kN. If the ultimate stress of the column is 480 N/mm^2, find the internal diameter of the column as factor of safety as 4. 5

(b) A simply supported beam of 6 m long and carrying a point load 16 kN at a distance of 2 m from its left end and a UDL of 4 kN/m for 3 m, from 1 m from its right end. Draw shear force diagram. 5

14. Draw shear force and bending moment diagram for a beam shown in the figure : 5+5



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 maximum skin stresses.

16. A hollow shaft is required to transmit 50 kW at 110 r.p.m. The maximum torque is 25% greater than mean torque. The allowable shear stress in shaft is 50 N/mm^2 and the twist over a length of 3 m is not to exceed 1°. The inner diameter is 0·75 times the outer diameter. Take $G = 0{\cdot}8 \times 10^5$ N/mm^2. Find suitable inside and outside diameters of the shaft.

17. (a) A cantilever length 2·5 m carries a UDL of 16·4 kN/m over the entire length. If $I = 7{\cdot}95 \times 10^7$ mm^4 and $E = 2 \times 10^5$ N/mm^2, determine the deflection at free end. 5

(b) List out the common applications of springs and give example. 5

18. A cylindrical shell 2·5 m long, 1 m diameter and metal thickness 10 mm is subjected to internal pressure 1·2 N/mm^2. Calculate the maximum intensity for shear stress induced and also change in dimensions of the shell. Assume $E = 2{\cdot}1 \times 10^5$ N/mm^2 and 1/m = 0·3.

★ ★ ★