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C14–M–305

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BOARD DIPLOMA EXAMINATION, (C–14)

SEPTEMBER/OCTOBER - 2020

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 *(a)* ultimate strength and *(b)* factor of safety.

2. A bar of 25 mm diameter is subjected to a pull of 50 kN. The measured extension over a gauge length of 200 mm is 0·1 mm and change in diameter is 0·0035 mm. Find the Poisson's ratio.

3. Define *(a)* resilience, *(b)* proof resilience and *(c)* modulus of resilience.

4. Define beam. Write any three types of beam.

5. Draw shear force diagram for a cantilever of length, L and subjected to u.d.l. of w N/m length.

6. State the bending equation and mention the units of the terms.

7. A cantilever of length 6 m is carrying a uniformly distributed load of 16 kN/m. Calculate the deflection at the free end, if I 95 10^7 mm^4 and E 2 1 10^5 N/mm^2.

8. Define the term 'polar modulus' of section.

9. A closely coiled helical spring of 20 coils has a wire diameter of 6 mm and mean coil diameter of 30 mm. Find the stiffness of the spring. Take G 8 2 10^4 N/mm^2.

10. Define *(a)* hoop stress and *(b)* longitudinal stress.

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 mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If E for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively, find the stresses developed in the rod and tube. Also find extension of the rod.

12. An MS bar of length 2 m and has a diameter of 50 mm, hangs vertically. A load of 20 kN falls on collar attached to the lower end. Find the maximum stresses when the *(a)* height of falling is 100 mm, *(b)* load is applied suddenly without impact and *(c)* load is applied gradually. Assume E 2 10^5 N/mm^2.

13. A beam of 10 m length simply supported at its ends carries a u.d.l. of 2 kN/m over the left-hand half of the span and a point load of 4 kN at the mid span. Find the maximum bending moment and draw SF and BM diagrams for the beam.

14. *(a)* Draw a stress-strain diagram for MS specimen and explain.

(b) A cantilever beam of 3 m long carries a point load of 4 kN at free end. Draw shear force and bending moment diagrams.

15. A beam of length 5 m has an inverted T-section with 80 mm × 20 mm flange and 80 mm × 20 mm web. It is simply supported at the ends and carries a uniformly distributed load of 2 kN/m. Calculate the maximum tensile and compressive stresses.

16. Select a suitable diameter of solid shaft to transmit 125 kW of power at 250 r.p.m., if the allowable shear stress is not to exceed 75 N/mm^2 and twist is not to exceed 1° in a length of 3 m. Take G 0 84 10^5 N/mm^2.

17. *(a)* A cantilever of 2·5 m long carries a concentrated load of 30 kN at a distance of 1·5 m from the fixed end. If MI of the section is 11×10^6 mm^4 and modulus of elasticity, E 2 10^5 N/mm^2, find the slope and deflection at free end.

(b) A close coiled helical spring of 120 mm mean diameter is made of 12 mm diameter rod and has 20 turns. The spring carries an axial load of 250 N. Determine the *(i)* shear stress and *(ii)* deflection when carrying this load. Assume G 0 84 10^5 N/mm^2.

18. A cylindrical shell 2·5 m long, 1 m in diameter and metal thickness 10 mm is subjected to an internal pressure of 1·25 N/mm^2. Calculate the maximum intensity of shear stress induced and also the change in the dimensions of the shell. Given E 2 10^5 N/mm^2 and Poisson's ratio = 0·24.

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