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C14–C–302

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BOARD DIPLOMA EXAMINATION, (C–14)

SEPTEMBER/OCTOBER - 2020

DCE—THIRD SEMESTER EXAMINATION

MECHANICS OF SOLIDS

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)* bending moment and *(b)* point of contraflexure.

2. Draw bending moment diagram for a cantilever carrying u.d.l. throughout the span.

3. A simply supported beam of span 7 m carries a concentrated load of 70 kN at a distance of 3 m from the right-hand support. Draw SFD and BMD.

4. Define *(a)* neutral axis and *(b)* radius of curvature.

5. List any three assumptions made in the theory of simple bending.

6. Define *(a)* section modulus and *(b)* flexural rigidity.

7. Draw deflected shapes of symmetrically loaded beams with different end conditions.

8. Define *(a)* strength and *(b)* stiffness.

9. A cantilever of 3 m span is subjected to a UDL of 8 kN/m throughout. Find the maximum deflection. Take EI 4000 kN/m^2.

10. A simply supported beam of span 4 m carries a point load of 30 kN at its mid span. Find the maximum slope and deflection by moment area method. Take EI 4000 kN/m^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 cantilever beam of 4 m long carries a u.d.l. of 2 kN/m for 1 m from fixed end and 4 kN/m for 1 m from the free end. Draw SFD and BMD.

12. Draw shear force and bending moment diagrams for simply supported beam loaded with two point loads of 15 kN under 10 kN at a distance of 2 m and 4 m respectively from left support.

13. A thin steel rule having a cross-section 0·625 mm thick and 25 mm wide is bent by couples applied at its ends so that a length 250 mm of the circular arc subtends a central angle 60°. Calculate the maximum stress induced in the rule and the magnitude of bending moment. Take E 210 kN/mm^2.

14. A test specimen beam 25 mm square in section is broken by a load of 800 N applied at middle of span 1 m. Using a factor of safety of 6, calculate the safe u.d.l. for the beam of 120 mm wide and 300 mm deep freely supported over a span of 5 m.

15. A cantilever 4 m span carries a point load of 20 kN at 3 m from the fixed end. Find the slope and deflection at the free end and under the load using Mohr's theorems. E 200 kN/mm^2 and I 360 10^6 mm^4.

16. A simply supported beam of span 6 m carries a point load 10 kN placed at a distance of 2 m from RHS. Determine the slope at the ends and maximum deflection.

Take E 200 kN/mm^2, I 48 10^6 mm^4. Use Macauley's method.

17. Find the thickness required for the bottom section of a vertical stand pipe, when the height of water is 40 m. The diameter of the pipe is 6 m. Assume the safe tensile stress for the pipe material to be 150 N/mm^2. Density of water = 10 kN/m^3.

18. A steel shaft 100 mm in diameter is subjected to pure twisting moment and is 20 m long. It is driven at one end while the power is taken off at the other end. One end of the shaft moves 30° in advance the other end. Find the maximum shear stress in the shaft and the torque. Given G 80 kN/mm^2.

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