C16-C–302

6223

BOARD DIPLOMA EXAMINATION, (C-16)

MAY/JUNE—2023

DCE - THIRD SEMESTER EXAMINATION

STRENGTH OF MATERIALS AND THEORY OF STRUCTURES

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. State the bending equation with usual notations. 3

2. A wooden beam 100 mm wide, 200 mm deep and 3 m span is simply supported and carrying an UDL of 30 kN/m over the entire span. Determine maximum shear stress. 3

3. Distinguish between strength and stiffness of a beam. 3

4. Define *(a)* Mohr's theorem-I and *(b)* Mohr's theorem-II for slope and deflection. 1½+1½

5. Define the term principal stress and state its units. 3

6. Determine the polar moment of inertia of hollow circular shaft of external diameter 20 mm and internal diameter 10 mm. 3

7. A cylindrical shell of 2·5 m diameter and 20 mm thick is subjected to an internal pressure of 3 N/mm^2. Find the circumferential and longitudinal stress developed in the material of the cylinder. 3

8. State the effective length of column for any three types of end conditions. 3

9. Mention any three stability conditions for a dam. 3

10. Define a frame and list any two types of frames. 3

PART—B

10×5=50

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

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

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

11. A cantilever beam 2.5 m long and of rectangular cross-section carries a u.d.l of 20 kN/m over its entire span. If the maximum stress induced is 125 N/mm^2, find the dimensions of the beam. Take $d = 1.5\,b$. 10

12. A 300 mm × 150 mm RSJ of I-section with flange and web thickness 20 mm is used as a simply supported beam over a span of 6 m and carries a UDL of 25 kN/m. Calculate the shear stress at salient points and plot the shear stress distribution diagram. 10

13. A simply supported beam 6 m long, carries a point load of 20 kN which acts at 3 m from right support. Calculate the deflection under point load using double integration method. Take $E = 200$ kN/mm^2 and $I = 156.5 \times 10^6$ mm^4. 10

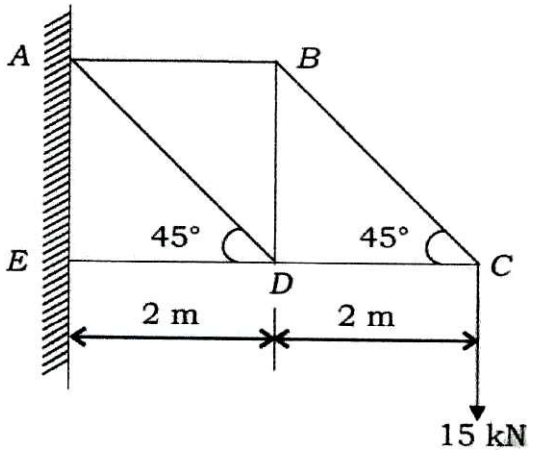
14. A cantilever beam AB of span 5 m which is fixed at A and propped at B, carries a point load of 12 kN at its mid span. Find the reaction at prop and draw SFD and BMD. 10

15. A hollow steel tube 200 mm external diameter and 10 mm thick is 3·5 m long. It is used as a column. If E for steel tube material is 2×10^8 kN/m^2, determine the safe buckling load on the column if *(a)* both ends are fixed and *(b)* one end is fixed and the other end is hinged. Take factor of safety as 4. 5+5=10

16. A circular bar 5 m long with both ends fixed, buckles at 35 kN of axial load. Determine the diameter of circular bar using Rankine's theory. Take $f_c = 330$ N/mm^2 and $a = 1/7500$. 10

17. A masonry dam of trapezoidal section is 2 m wide at top and 5 m wide at bottom is 8 m high and retains water on the vertical face to a height of 6 m. Find the maximum and minimum stress at the base and draw the stress diagram. Given specific weight of masonry is 22·5 kN/m^3 and specific weight of water is 10 kN/m^3. 10

18. Determine the magnitude and nature of forces in all members of the truss shown below : 10



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