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C16-C–302

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BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER/NOVEMBER—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 any three assumptions made in the theory of simple bending. 3

2. A circular beam of 160 mm diameter is subjected to a shear force of 12 kN. Calculate the value of maximum shear stress. 3

3. Draw the deflected shapes of *(a)* cantilever beam and *(b)* simply supported beam. 1½+1½=3

4. Calculate the slope and deflection for a cantilever beam of span 6 m and carries a UDL of 5 kN/m over its entire span. Take $E = 210$ kN/mm^2 and $I = 156{\cdot}5\times10^6$ mm^4. 3

5. State Mohr's theorems. 3

6. State the torsion equation for a circular shaft and explain the terms along with units. 3

7. Define Hoop stress and Longitudinal stress. 1½+1½=3

8. If the actual length of the column is 5 m, determine the effective length with any three different end conditions. 3

9. State the middle third rule in dams. 3

10. State any two methods used for analysing statically determinate 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 rectangular beam 100 mm × 250 mm is 3 m long and is simply supported at the ends. It carries a point load of 12 kN at mid-span. Determine the maximum bending stress induced in the beam. (Neglecting the self-weight of beam). Sketch bending stress distribution diagram across the section. 10

12. A rectangular beam 150 mm wide and 450 mm deep is subjected to a maximum shear force of 60 kN. Determine the following : 3+3+4=10

(a) The average shear stress

(b) The maximum shear stress

(c) The shear stress at a distance of 65 mm above the NA

13. Calculate the maximum slope and deflection of a simply supported beam carrying a UDL of 20 kN/m over its entire span of 8 m using Mohr's theorem. Take $E = 210$ kN/mm^2 and $I = 360 \times 10^6$ mm^4. 10

14. A Cantilever beam of length 3·5 m is subjected to two-point loads 20 kN and 35 kN acting at 2·0 m and 3·5 m from fixed end respectively. Find the maximum slope and deflection. Take $EI = 8000$ kN/m^2. 10

15. A hollow cast iron column is 5 m long and 300 mm external diameter with ends rigidly fixed to carry a safe load of 1200 kN. Find the suitable thickness of the metal. Take factory of safety = 4 and $E = 0{\cdot}8 \times 10^8$ kN/m^2. 10

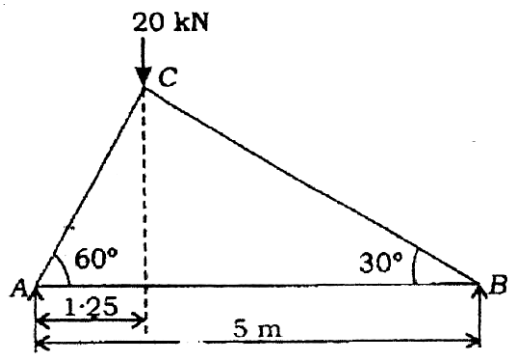
16. In a compression test for a 16 mm dia. pin-ended strut, the following results are obtained : 5+5=10

Length	Rankine's Crippling Load
300 mm	35 kN
500 mm	20 kN

From these observations, calculate two Rankine's constants.

17. A concrete dam of trapezoidal section is 15 m high and 3 m wide at top and 7 m wide at bottom. The water face is vertical and retains water up to 13 m. Check the stability of the dam for overturning, sliding and that no tensile stresses are developed at the base, if the coefficient of friction of the dam material and soil is 0·6. Specific weight of concrete is 24 kN/m^3. Specific weight of water is 10 kN/m^3. Find the maximum and minimum stresses at base and show the stress distribution at the base. 10

18. Determine the forces in the members *AB*, *AC* and *BC* of truss shown in below figure by method of joints. 10



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