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C16-C–302

# 6223

BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

DCE - THIRD SEMESTER EXAMINATION

## STRENGTH OF MATERIALS AND THEORY OF STRUCTURES

Time : 3 hours ] [ Total Marks : 80

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## PART—A

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 circular beam of 80 mm diameter is subjected to shear force of 25 kN. Calculate the value of maximum shear stress and sketch the variation of shear stress along the depth of the beam. 1½+1½=3

2. Define the following terms : 1½+1½=3

   (a) Moment of resistance

   (b) Modulus of section

3. Distinguish between strength and stiffness of a beam. 1½+1½=3

4. Sketch any three deflected shapes of beams with different support conditions. 1+1+1=3

5. State the importance of Mohr's circle. 3



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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. State any three differences between long and short columns. 1+1+1=3

9. List any three different forces acting on the gravity dam. 1+1+1=3

10. Define the terms Perfect frame and Imperfect frame. 1½+1½=3

## PART—B

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 300 mm × 450 mm is simply supported over the effective span of 6m and carries a udl of 20 kN/m over the entire span. Calculate the maximum bending stress and maximum shear stress. 10

12. A built up section of RSJ of depth 450 mm with two flange plates of sizes 280 mm wide and 18 mm one on each flange. The beam is simply supported over a span of 6m. Find the maximum uniformly disturbed load that can be placed on the beam, if the bending stress is limited to 165 MPa. $I_{xx}$ of RSJ is $245{\cdot}36 \times 10^6$ mm$^4$. 10

13. A simply supported beam of span 8 m carries three point loads of 30 kN, 20 kN and 50 kN at a distance of 2 m, 4 m and 6 m respectively from left hand side. Determine the position and amount of maximum deflection. Given I = $695 \times 10^6$ mm$^4$ and E = 200 kN/mm$^2$. Use Macaulay's method. 10

14. A simply supported beam of span 5m carries a uniformly disturbed load of 20 kN/m over the whole span. Find the maximum slope and deflection. EI = 35000 kNm$^2$. Use Double Integration method. 10

15. The column is of rectangular shape of size 200 × 100 mm. The column carries compressive load of 25 kN. Factor of safety is 3 and E = 2·1 × $10^8$ kN/m$^2$. Determine the length of the column whose one end is fixed and the other end is free. 10

16. An axially loaded column 5 m high and having both ends fixed is made of a wide flanged RSJ having the following properties :

Section : 300 × 200 mm ; Area = 7000 mm$^2$ ; $I_{vv}$ = 124 × $10^6$ mm$^4$ ; $I_{yy}$ = 17·6 × $10^6$ mm$^4$ ; E = 2 × $10^8$ kN/m$^2$. Find the safe working load of a column using Euler's formula, if one end of the column is fixed and the other end is hinged. Take factor of safety as 4. 10

17. A concrete dam of rectangular section 22 m high and 8 m wide contains water upto a height of 20m. Find 2½+2½+2½+2½=10

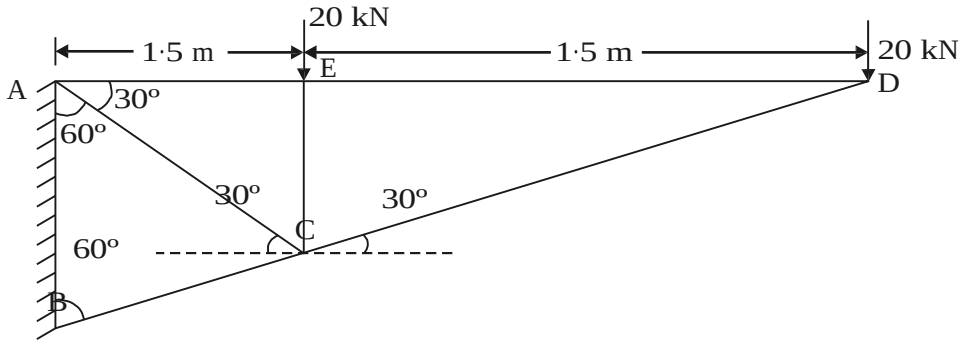
(a) Total Pressure/m length of dam

(b) The point where the resultant pressure cuts the base

(c) The maximum stress at the base

(d) The minimum stress at the base

18. Determine the forces in the members of a cantilever truss shown below in the figure by method of joints.

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