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C09–C–303

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2016

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. Define the terms *(a)* bending stress, *(b)* neutral axis and *(c)* moment of resistance. 1×3=3

2. A timber joist of square section 200 mm×200 mm is simply supported at the ends and carries a UDL of 25 kN/m over a length of 3 m. Calculate the maximum bending stress induced in beam. 3

3. Calculate the slope and deflection for a cantilever beam of span 6 m and carries a UDL of 4 kN/m over its entire span. Take E 200 kN/mm^2 and I 156·5 10^6 mm^4. 1½+1½

4. Define stiffness and draw the deflected shape of cantilever beam and two-span continuous beam. 1+1+1

5. Calculate the prop reaction when the prop is placed at free end for a cantilever beam of length 4 m and carries a point load 20 kN at mid-span. 3

6. Define slenderness ratio and calculate the slenderness ratio for a rectangular column 200 mm×300 mm and 4 m long with both ends fixed. 1+2

7. Calculate the Euler's load for a circular column 60 mm diameter and 4 m long with both ends hinged. Take E 80 kN/mm^2. 3

8. Define *(a)* active earth pressure, *(b)* passive earth pressure and *(c)* angle of repose. 1+1+1

9. Define a frame and list different types of frames. 3

10. Calculate the torque required for a shaft of 80 mm diameter and 10 m long with an angle of twist of 30°. Take G 80 kN/mm^2. 3

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)* List any five assumptions made in theory of simple bending. 5

(b) Calculate the dimensions of a strongest rectangular section which can be derived from a wooden log of 300 mm diameter. 5

12. A 300 mm×150 mm RSJ of I-section with flange and web thickness 15 mm is used as a simply supported beam over a span of 8 m and carries a UDL of 30 kN/m. Calculate the shear stress at salient points and plot the shear stress distribution diagram. 8+2

13. Calculate the maximum intensity of load that can be placed over a rectangular beam of 150 mm×350 mm deep over a span of 6 m, if maximum permissible bending stress is not to exceed 160 N/mm^2 and maximum deflection is limited to 12 mm. Take E 210 kN/mm^2 and I 120 10^6 mm^4. 10

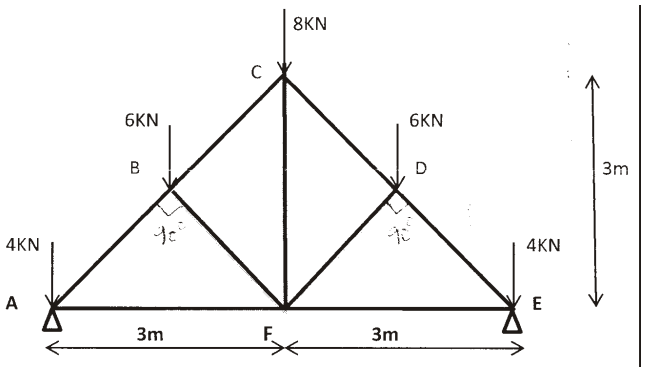
14. Calculate the maximum slope and deflection of a simply supported beam carrying a UDL of 20 kN/m over its entire span of 8 m using Mohr's theorem. Take E 210 kN/mm^2 and I 360 10^6 mm^4. 4+6

15. Design a column to carry an axial load of 500 kN. The column is of hollow circular section and 4 m long with one end fixed and other hinged. Take external diameter = 1·25 internal diameter. E 210 kN/mm^2. 10

16. Calculate the safe load for a hollow circular column having external diameter 250 mm and 25 mm thick is 4 m long with both ends fixed. Use Rankine's formula with factor of safety = 4. Also calculate slenderness ratio and ratio of Rankine's to Euler's critical load. Take f_c 550 N/mm^2, 1 / 1600 and E 2 10^5 N/mm^2. 5+2+3

17. A masonry wall 15 m height has a vertical backfill up to top having a top width of 3 m. Calculate the minimum base width required to withstand the compressive stress only. Take specific weight of masonry and soil as 23 kN/m^3 and 18 kN/m^3. Angle of repose 30°. 10

18. Find the forces in each member for the truss shown below, using method of joints : 10



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