



c09-c-303

3219

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 $E = 200 \text{ kN/mm}^2$ and $I = 156.5 \times 10^6 \text{ mm}^4$. 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 $E = 80 \text{ kN/mm}^2$. 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 $G = 80 \text{ kN/mm}^2$. 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 $E = 210 \text{ kN/mm}^2$ and $I = 120 \times 10^6 \text{ mm}^4$. 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 $E = 210 \text{ kN/mm}^2$ and $I = 360 \times 10^6 \text{ mm}^4$. 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. $E = 210 \text{ kN/mm}^2$. 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 $f_c = 550 \text{ N/mm}^2$, $1/1600$ and $E = 2 \times 10^5 \text{ N/mm}^2$. 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


