

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

3

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.
- Define the terms (a) bending stress, (b) neutral axis and (c) moment of resistance.
- 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.** 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 $I = 156.5 \times 10^6 \text{ mm}^4$.
- **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.

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- Define slenderness ratio and calculate the slenderness ratio for a rectangular column 200 mm×300 mm and 4 m long with both ends fixed.
- 7. Calculate the Euler's load for a circular column 60 mm diameter and 4 m long with both ends hinged. Take $E = 80 \text{ kN/mm}^2$.
- **8.** Define (*a*) active earth pressure, (*b*) passive earth pressure and (*c*) angle of repose.
- **9.** Define a frame and list different types of frames.
- 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/mm².

PART-B

10×5=50

3

5

5

3

3

- **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.
 - (b) Calculate the dimensions of a strongest rectangular section which can be derived from a wooden log of 300 mm diameter.
- 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 $E \quad 210 \text{ kN/mm}^2$ and $I \quad 120 \quad 10^6 \text{ mm}^4$.

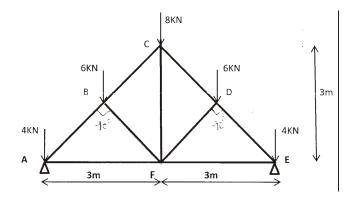
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- 14. Calculate the maximum slope and deflection of a simply supported beam carrying a UDL of 20 kN/m over its entire span of 8 m using Mohr's theorem. Take $E = 210 \text{ kN/mm}^2$ and $I = 360 = 10^6 \text{ mm}^4$.
- **15.** Design a column to carry 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

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/mm², 1/1600 and E 2 10^5 N/mm². 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/m³ and 18 kN/m³. Angle of repose 30°.
- **18.** Find the forces in each member for the truss shown below, using method of joints :



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