C09–C–303

3219

BOARD DIPLOMA EXAMINATION, (C–09)

APRIL/MAY—2015

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. A steel strip of 30 mm thickness and 60 mm width is bent round a circular drum of 40 m diameter. Calculate the maximum stress due bending, if E 200 kN/mm^2.

2. Write the general equation for shear stress distribution over any cross-section and explain the terms.

3. Write any three advantages of Macaulay's method of determining slope and deflection of beams.

4. State the relation among curvature, slope and deflection of a loaded beam and explain the terms.

5. State any three cases of beams where Mohr's theorems can be used easily.

6. In the case of columns, define—
   (a) actual length;
   (b) safe load.

7. Give any three examples of compression members.

8. Differentiate between surcharge and surcharge angle.

9. Distinguish between a deficient frame and a redundant frame.

10. Define polar modulus of section and state its units.

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. Find the width and depth of the strongest beam of rectangular section which can be cut out of a circular section of diameter D. Hence obtain the size of the strongest beam that can be cut out of a circular log of wood which has 220 mm diameter.

12. A simply supported wooden beam of 1·2 m span and rectangular cross-section 150 mm wide and 250 mm depth carries a concentrated load P at its mid section. Allowable working stresses in bending and shear are 7 N/mm^2 and 1·1 N/mm^2 respectively. What is the safe value of the concentrated load P ?

13. A wooden rectangular beam carries a u.d.l. of 10 kN/m over a span of 6 m and is simply supported at the ends. Determine the section of the beam, if the central deflection is limited to 15 mm and the maximum bending stress to 10 N/mm^2. Given E 10 kN/mm^2.

14. A cantilever beam of span 3 m propped at its free end is subjected to a u.d.l. of 10 kN/m over its entire span. Determine the prop reaction and draw the SFD and BMD showing the values at salient points.

15. A hollow cylindrical cast iron column is 4 m long both ends being fixed. Design the column to carry an axial load of 250 kN. Use Rankine's formula and adopt a factor of safety of 4. The internal diameter may be taken as 0·80 times the external diameter. Take f_c 550 N/mm^2 and a or (1 / 1600).

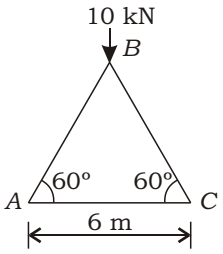
16. For what length of a hollow steel bar of 40 mm external diameter and 30 mm internal diameter used as a strut, the Euler's theory is applicable for buckling if ultimate compressive strength is 0·33 kN/mm^2, E 210 kN/mm^2—

(a) when both the ends are hinged;

(b) one end is fixed, other end is free?

17. A concrete dam of trapezoidal section 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 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 23 kN/m^3 and specific weight of water is 10 kN/m^3.

18. Determine the forces in all the members of the truss shown in figure by method of joints :



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