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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

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 flat of size 120 mm wide and 25 mm thick is bent into a circular arc of radius 5 m. Find the maximum stress induced in the flat due to bending. Take E 2 10^5 N/mm^2.

2. A circular beam of 150 mm diameter is subjected to a shear force of 10 kN. Calculate the value of maximum shear stress.

3. What is the magnitude of BM required for a steel flat of 100 mm × 8 mm thick in order to bend it into a circular arc of 12 m radius? Also calculate the central deflection, if the length of flat is 2·4 m and E = 200 kN/mm^2.

4. State the Mohr's theorems.

5. Define stiffness of the beam and flexural rigidity.

6. Define *(a)* factor of safety and *(b)* slenderness ratio in the case of columns.

7. Define *(a)* crushing load and *(b)* crippling load.

8. A dam section is trapezoidal in shape with vertical water face having top width 2 m base width 6 m and the height of the dam 6 m. Locate the position of CG of the dam section measured from the water face.

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 ratio of moment of resistance of two sections of same material and of same cross sectional area. The first one is a solid circular section of 320 mm diameter and second one is a hollow circular section of internal diameter 0·6 times external diameter.

12. A 300 mm deep, 150 mm wide rolled steel joist of I-section with flanges 15 mm thick, web 10 mm thick is used as simply supported beam of span 4 m. Find the u.d.l. the beam can carry without exceeding the shear stress of 40 N/mm^2.

13. A simply supported beam 5 m long carries a u.d.l. of 4 kN/m run over a length of 2 m from right-hand support. Calculate the maximum slope and deflection. Use Macaulay's method. Take E 10 kN/mm^2 and moment of inertia I 3 375 10^8 mm^4.

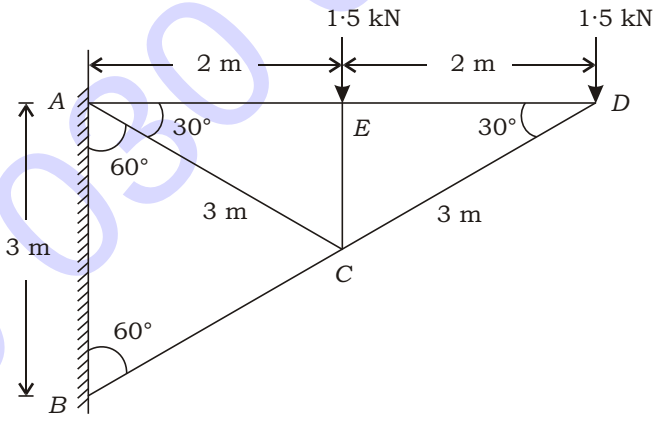
14. A cantilever beam AB of span 4 m which is fixed at A and propped at B. It carries a point load of 10 kN at its midspan. Find the reaction of the prop and draw SFD and BMD showing the values at salient points.

15. Determine the ratio of crippling loads given by Rankine's and Euler's formula for hollow circular cast iron column both ends pin jointed, 4 metres long, having outer diameter 150 mm and inner diameter 145 mm. Given f_c = 560 N/mm^2, E = 210 kN/mm^2, a 1 / 1600.

16. A column 1 m long has an area of cross-section of 900 mm^2. Find the slenderness ratio if the section is *(a)* circular, *(b)* square, and *(c)* rectangular with depth twice the width. State which of the column is strongest.

17. A masonry wall 12 m high has a vertical back and retaining earth level with its top. The top width of the wall is 3 m. Specific weight of masonry is 21·6 kN/m^3 and that of earth is 10·8 kN/m^3. Angle of repose of earth is 30°. Determine the minimum base width required for the wall so that stresses at the base are wholly compressive. Calculate also the maximum normal stress at the base.

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



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