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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2013

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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define simple bending and bending stress.

2. A circular beam of 100 mm diameter is subjected to a shear force of 5 kN. Calculate the maximum shear stress and draw the variation of shear stress along the depth of the beam.

3. Show the deflected shapes of the following :

(a) Simply supported beam

(b) Cantilever beam

(c) Overhanging beam

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

5. What is propped cantilever and why is it said to be statically indeterminate?

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

7. Differentiate between long column and short column.

8. List any three failures of a retaining wall.

9. Name the various methods which are employed in finding out the forces in a frame.

10. Determine the polar moment of inertia of a hollow circular shaft of external diameter 20 mm and internal diameter 10 mm.

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 beam of I-section, 150 mm deep and 80 mm wide has flanges 6·8 mm thick and web 4·8 mm thick is simply supported and carries a u.d.l. of 20 kN/m over its entire span. Find the maximum permissible span without exceeding the shear stress of 60 N/mm^2.

12. A T-section of 150 mm×100 mm×15 mm is provided as a cantilever for a length of 3 m with its flange at the top, carries a load W at its free end. What can be the maximum value of W, so that the stress in the section must not exceed 50 N/mm^2? Also calculate the actual stresses in tension and compression due to bending.

13. Two concentrated loads 80 kN and 100 kN are acting over a simply supported beam of span 6 m at distances of 2 m and 3 m respectively from left end. Determine the position and amount of maximum deflection using Macaulay's method.
[Given EI 3000 kN-m^2]

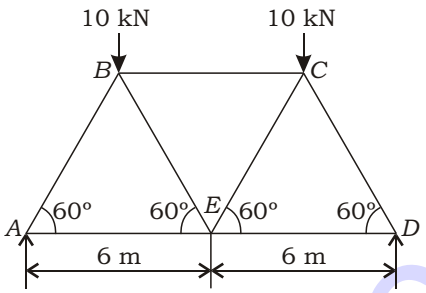
14. A simply supported beam of span 4 m carries a u.d.l. of 20 kN/m including its self weight. The width of wooden rectangular beam is 300 mm. The permissible bending stress is not to exceed 5 N/mm^2 and the central deflection is not to exceed 6 mm. Determine the depth of beam required. [Take E 1·25 10^4 N/mm^2]

15. An I-section of top and bottom flanges 200 mm×20 mm and web 20 mm×360 mm, and 6 m long is used as a strut with both ends fixed. What is Euler's crippling load for the column?
[Take E 2 10^5 N/mm^2]

16. 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]

17. A trapezoidal masonry dam 5 m high, 1 m wide at its top and 3 m wide at its bottom retains water on its vertical face. What are the maximum and minimum stresses at the base when the reservoir is empty? [Take $_m$ 22 kN/mm^3 and $_w$ 9·81 kN/mm^3]

18. Determine the forces in the members *AB*, *AE*, *BE* and *BC* of the truss shown in the figure below by method of joints :



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