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C14–C–302

4226

BOARD DIPLOMA EXAMINATION, (C–14)

MARC/APRIL—2018

DCE—THIRD SEMESTER EXAMINATION

MECHANICS OF SOLIDS

Time : 3 hours] [*Total Marks* : 80

PART—A 3×10=30

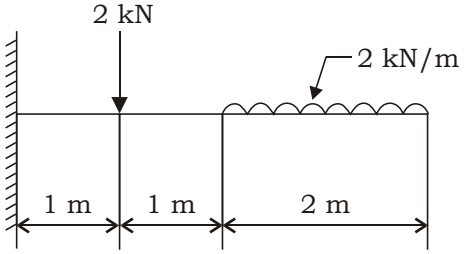
Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

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

1. List the various types of end supports. Show them with neat sketches.

2. Calculate the maximum bending moment and shear force for the cantilever loaded as shown in the figure.



3. Define *(a)* point load and *(b)* uniformly distributed load.

4. Sketch the shear stress distribution for a homogeneous beam of *(a)* rectangular section and *(b)* symmetrical section.

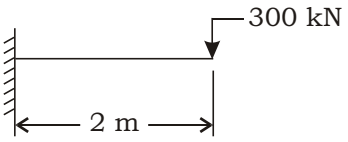
5. Explain the theory of simple bending.

6. Define the terms *(a)* bending stress and *(b)* shear stress.

7. State Mohr's theorem and its limitations.

8. State the purpose for which moment area method is used.

9. A cantilever of 2·0 m long carries a load of 350 kN at its free end. Find the deflection at the free end. Assume E 200 g N/m^2 and I 210 10^6 cm^4.



10. A beam of 60 mm wide and 120 mm deep is placed 2 m apart and is subjected to a central point load of 52 kN. If the central deflection is found to be 5 mm, calculate the Young's modulus of elasticity of the materials.

PART—B

10×5=50

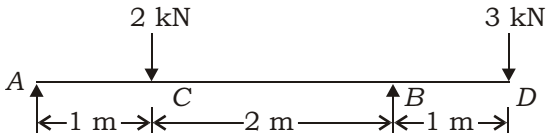
Instructions : (1) Answer *any* **five** questions.

(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 length 5 m, simply supported over a span of 4 m is having 1 m overhang on the right-hand support. It carries two point loads of 2 kN and 4 kN at the distance of 3 m and 5 m from left-hand side and a uniformly distributed load of 2 kN/m spread over 3 m from left-hand side. Draw the shear force and bending moment diagrams. State the position and magnitude of maximum positive bending moments and the position of point of contra-flexure.

12. Draw the shear force and bending moment of the overhanging beam as shown below :



13. A rectangular beam of 250 mm × 450 mm is subjected to a maximum shear force of 750 kN. Calculate intensity of shear stress at height of 125 mm above neutral axis.

14. A cantilever has a free length of 3 m. It is a T-section with dimensions of the flange as 100 mm × 200 mm and that of the web as 200 mm × 100 mm, the flange being in tension. Calculate the load per metre run that can be applied if the maximum tensile stress is 40 N/mm^2. Calculate the maximum compressive stress.

15. Derive the formula for maximum slope and deflection of standard cases by moment area method.

16. A simply supported beam of span 6 m carries a point load 10 kN placed at a distance of 2 m from RHS. Determine the slope at the ends and maximum deflection.

Take E 200 kN/mm^2, I 48 10^6 mm^4. Use Macauley's method.

17. A cylindrical shell 3 m long has 1 m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stress induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1·5 N/mm^2.

18. Determine the maximum power, a hallow shaft of 100 mm external diameter and 60 mm internal diameter can transmit at 180 r.p.m. If the maximum shear stress is limited to 60 N/mm^2, the maximum torque is likely to exceed the mean torque by 20%.

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