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C20-C–302

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BOARD DIPLOMA EXAMINATION, (C-20)

FEBRUARY/MARCH — 2022

DCE - THIRD SEMESTER EXAMINATION

MECHANICS OF SOLIDS 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. Define 'simple or pure bending'.

2. Define 'modulus of section'.

3. Calculate the maximum deflection for a simply supported beam of span 4 m and carrying an udl of 3.0 kN/m over the entire span. Take EI = 40000 kN-m^2.

4. State Mohr's theorem-II.

5. Write Euler's and Rankine's formulae.

6. List the three forces acting on a dam.

7. Calculate the horizontal water pressure per metre length acting on a trapezoidal dam of base width 6 m, top width 3 m and a height of 10 m retaining water to a depth of 9 m on its vertical face.

8. Sketch the BMD for a fixed beam loaded with point load '*P*' at mid span and having a length '*L*'.

9. Calculate the degree of static indeterminacy of *(a)* propped cantilever, *(b)* fixed beam and *(c)* two span continuous beam.

10. State the three methods of analysis of frames.

PART—B

8×5=40

Instructions : (1) Answer **either** *(a)* **or** *(b)* of each question from *Part—B*.

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

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Find a suitable depth and width for a rectangular beam over a span of 8 m to carry udl of 20 kN/m, if $b = d/2$ and the bending stress is not to exceed 18 N/mm^2.

(OR)

(b) A beam is of solid circular section 150 mm in diameter. Compare the weight of beam of equal strength and of hollow circular section with internal diameter = 0.8 times the external diameter.

12. *(a)* A beam 6 m long, simply supported at both ends carries a load 6 kN at a distance of 4 m from LHS. Using Macaulay's method, determine the slope at the ends and maximum deflection. Given E = 200 kN/mm^2 and I = 48 × 10^6 mm^4.

(OR)

(b) A concentrated load of 4 kN is acting at the centre of a simply supported beam of span 6 m. Determine the value of flexural rigidity of the beam section, if the maximum deflection is 10 mm.

13. *(a)* Calculate the necessary thickness of metal in a cast iron pillar 5 m long and 300 mm external diameter, fixed at both ends, to carry a load of 400 kN, the ultimate load being 5 times greater than safe load. Given E = 95.5 GN/m^2.

(OR)

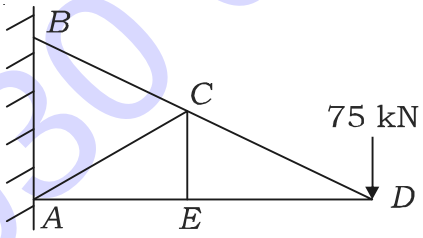
(b) A straight bar of an alloy, 1.5 m long is used as a strut with both ends fixed, when an axial load of 35 kN is applied, the bar is found to buckle. What should be the diameter of the bar? E = 90 kN/mm^2.

14. *(a)* Draw 'SFD' and 'BMD' for a propped cantilever of span 4 m with prop at the end, when it is subjected to a point load of 30 kN at middle of the beam.

(OR)

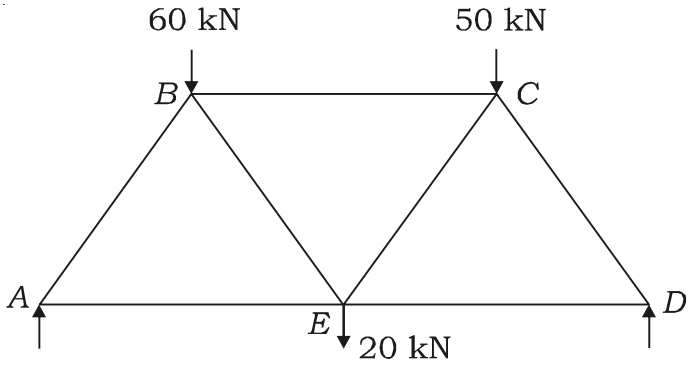
(b) Draw 'SFD' and 'BMD' for a two span continuous beam with spans AB = 6 m subjected to an udl of 10 kN/m over the entire span and BC = 3 m subjected to a point load of 10 kN at the middle of the span, using moment area method.

15. *(a)* Find the member forces of the cantilever truss shown in the figure below and tabulate the results using method of joints. AB = AC = BC = CD = 3 m, angle BAD = 90° and angle CED = 90°.



(OR)

(b) Calculate the member forces for the frame shown below by method of sections. The internal angle between adjacent members is 60°.



PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

16. Check the stability of a retaining wall of base width 10 m, height 20 m, top width 6 m, with vertical retaining face, retains earth in level with the top. Given, density of masonry = 24 kN/m^3, unit weight of soil = 18 kN/m^3, angle of repose of the soil = 30°.

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