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C14–C–**402**

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BOARD DIPLOMA EXAMINATION, (C–14)

SEPTEMBER/OCTOBER - 2020

DCE—FOURTH SEMESTER EXAMINATION

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. Find the least radius of gyration of a hollow circular column of 200 mm external diameter with 10 mm metal thickness.

2. What is meant by *(a)* dam and *(b)* retaining wall?

3. With usual notations, write the formula for finding the earth pressure on a retaining wall with vertical earth face and backfill with surcharge.

4. Define the following :

(a) Angle of repose

(b) Passive earth pressure

5. Find the minimum depth of foundation for a square column of 1·5 m × 1·5 m carrying a load of 450 kN in a soil weighing 15 kN / m^3 and having angle of repose = 30°.

6. State any two merits and demerits of continuous beams over simply supported beams.

7. A fixed beam of 4 m span carries a u.d.l. of 20 kN/m on its entire span. Calculate the fixed-end moments.

8. Define the following :

(a) Distribution factor

(b) Stiffness factor

9. Write a short note on the classification of frames.

10. Explain the stepwise procedure for any one method of truss analysis.

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 cast iron hollow cylindrical column 3 m in length, when hinged at both ends, has a critical buckling load of P kN. When the column is fixed at both the ends, its critical load rises to (P 300) kN. If the ratio of external diameter to internal diameter is 1·25 and E 100 kN / mm^2, determine the external diameter of the column.

12. A hollow cast iron column of external diameter 200 mm and 4 m long with both ends hinged, supports an axial load of 800 kN. Find the thickness of metal required. Take factor of safety of 4. Use Rankine's constant f_c 320 N / mm^2 and a 1 / 6400.

13. A trapezoidal masonry dam of 12 m high retains water on its vertical face with a freeboard of 2 m. If the top width is 2·5 m, find the minimum base width required to avoid tension at the base. Take specific weight of masonry as 22 kN / m^3 and that of water as 10 kN / m^3.

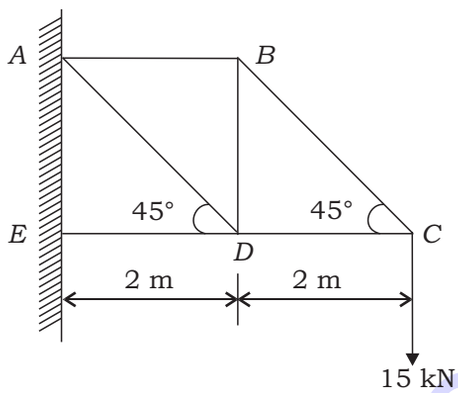
14. A trapezoidal retaining wall 9 m high, 1 m wide at the top and is 3 m wide at the base. It retains earth on its vertical face in level with the top of the wall. Find the maximum and minimum stresses across the base. Take weight of masonry and earth as 24 kN/m^3 and 20 kN / m^3 respectively. Take angle of repose of earth 40 .

15. A horizontal cantilever timber beam 100 mm ×150 mm deep and 3 m long is subjected to a u.d.l. of 4 kN/m over its entire span. If it is propped at free end to the level of the fixed end, find the prop reaction and construct the shear force and bending moment diagrams.

16. A beam of 6 m span has its ends firmly built-in, carries a central point load of 30 kN. Find the fixed-end moments and draw the shear force and bending moment diagrams. State the position of points of contra-flexure. Also find its central deflection. Take *EI* 50000 kN-m^2.

17. A continuous beam *ABC* is simply supported at *A*, *B* and *C*. Span *AB* is of length 6 m and carries a central point load of 10 kN. Span *BC* is of length 5 m and carries a u.d.l. of 3 kN/m on entire span *BC*. Using Clapeyron's theorem of three moments, calculate the support moments and draw the shear force and bending moment diagrams.

18. Find the magnitude and nature of forces in all members of the truss shown below :



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