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C16–C–302

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BOARD DIPLOMA EXAMINATION, (C–16)

OCT/NOV—2017

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. Define the following : 1+1+1

(a) Flexural rigidity

(b) Neutral axis

(c) Section modulus

2. A square beam 150 mm side is subjected to a shear force of 15 kN. Calculate the value of maximum shear stress. 3

3. Draw the deflected shapes of : 1½+1½

(a) Cantilever beam

(b) Simply supported beam

4. A cantilever beam of span 4 m carries a UDL of 10 kN/m over the entire span. Calculate the deflection at free end. Given $EI \quad 600 \quad 10^9$ N / mm^2. 3

5. Define the following : 1½+1½

(a) Principal planes

(b) Principal stress

6. Calculate the torque required for a shaft of 60 mm diameter and 12 m long with an angle of twist being 3°. Take $G \quad 80$ kN / mm^2. 3

7. A cylindrical compressed air drum 1·9 m in diameter has to sustain air pressure of 3 N / mm^2. If the safe stress of the material is 70 N / mm^2. Find the necessary thickness of cylinder wall. 3

8. If the actual length of the column is 6 m, determine the effective length with any three different end conditions. 3

9. State the middle third rule in dams. 3

10. Define a frame and list any two types of frames. 2+1

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. An I-section has a depth 300 mm and MI of 71·97 × 10^6 mm^4. It is 6 m long and simply supported at its ends. Find the maximum fibres stress developed in the beam, when it is subjected to a UDL. 10

12. An I-section with rectangular ends, has the following dimensions :

Flanges : 200 mm × 20 mm

Web : 300 mm × 10 mm

Total depth : 340 mm

Find the maximum shearing stress developed in the beam for a shear force of 50 kN. Also sketch the shear stress distribution across the section. 10

13. A cantilever beam AB of span 4 m which is fixed at A and propped at B, carries a point load of 10 kN at its mid span. Find the reaction at prop and draw SFD and BMD. 10

14. Calculate the maximum slope and deflection of a simply supported beam carrying a UDL of 30 kN/m over its entire span of 6 m using Mohr's theorem. Take E 210 kN/mm^2 and I 360 10^6 mm^4. 5+5

15. A hollow cast iron column of 200 mm external diameter, 20 mm thickness is 4·5 m long is used as a strut with both ends fixed. Calculate the ratio of Euler's to Rankine's safe loads using a factor of safety 4. Given : E 100 kN / mm^2, f_c 550 N / mm^2 and a 1 / 1600.

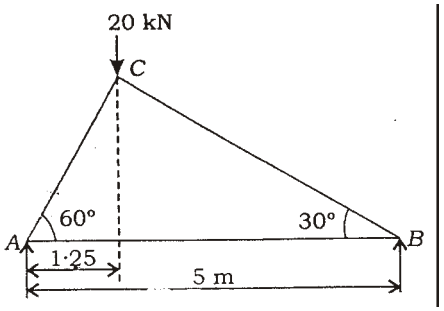
16. In a compression test for a 16 mm dia pin-ended strut, the following results are obtained :

Length	*Rankine's Crippling Load*
200 mm	35 kN
500 mm	20 kN

From these observations, calculate two Rankine's constants.

17. A concrete dam of trapezoidal section 16 m high and 4 m wide at top and 8 m wide at bottom. The water face is vertical and retains water up to 14 m. Check the stability of the dam for overturning, sliding and tensile stress at the base, if the coefficient of friction of the dam material and soil is 0·7. Specific weight of concrete is 24 kN / mm^3 and specific weight of water is 10 kN / mm^3. 10

18. Determine the forces in the members AB, AC and BC of truss shown in below figure (1) by method of joints. 10



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