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C16-C–302

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BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2021

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. A steel strip of 3 mm thickness and 60 mm width is bent round a circular drum of 4·0 m diameter. Calculate the maximum stress due to bending, if E = 200 kN/mm^2. 3

2. Write the formula for bending equation. Explain the parameters involved in it. 3

3. State any three differences between statically determinate and statically indeterminate structures. 1+1+1

4. State any three methods of determining the slope and deflection of beams. 1+1+1

5. Define the term Principal Stress and state its units. 3

6. The maximum shearing stress developed in 80 mm diameter steel shaft is 60 N/mm^2. If the shaft rotates at 300 rpm, find the power transmitted by the shaft. 3

7. Write formulae for hoop stress and strain, longitudinal stress. 3

8. Calculate the min. slenderness ratio of a column for which Euler's crippling load formula is applicable. Take $E = 2{\cdot}16 \times 10^5$ N/mm^2 and ultimate crushing stress is 350 N/mm^2. 3

9. List any three stability conditions for a dam. 3

10. What is meant by statically determinant frames. 3

PART—B

10×5=50

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

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

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

11. An I – section joist of equal flanges is used over a span of 3·6 m. Find what udl it can carry, if the allowable stress in the material is 140 N/mm^2. The size of the I – section are : Top and bottom flanges = 100 × 10 mm; web 10 × 150 mm.

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

Flanges = 200 × 20 mm

Web = 300 × 20 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.

13. A timber beam of rectangular section 100 mm wide and 250 mm deep, supports over a span of 5 m. Find the magnitude of central point load it can carry, if the maximum permissible deflection is 5mm. Take $E = 1 \times 10^4$ N/mm^2.

14. A rolled steel beam (simply supported) having a span of 6 m carries a point load of 40 kN at a distance of 4 m from left support. Find the deflection under the load and also find the position and amount of maximum deflection. Take $E = 200$ kN/mm^2; $I = 156{\cdot}25 \times 10^6$ mm^4.

15. Find the Euler's critical load for a hollow cylindrical cast iron column 200 mm external diameter and 25 mm thick, if it is 6 m long and hinged at both ends. Take $E = 20 \times 10^4$ N/mm^2. Determine the ratio of crippling loads given by Rankine's and Euler's formula. Taking $f_c = 550$ N/mm^2 and $\alpha = 1/1600$.

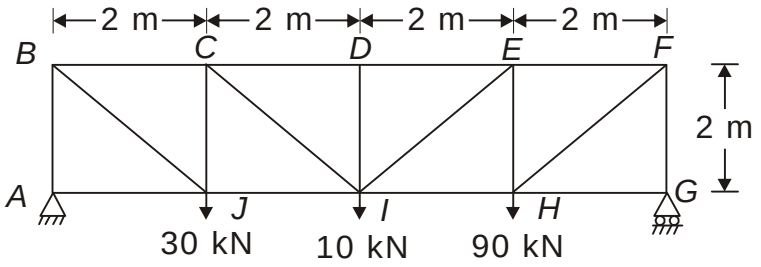
16. A hollow steel tube 200 mm external diameter and 10 mm thick is 3·5 m long. It is used as a stanchion. If E for steel tube material is 2×10^8 kN/m^2, determine the safe buckling load on the stanchion if

(a) Both ends of the stanchion are fixed and

(b) One end of the stanchion is fixed and the other end is hinged. Take factor of safety as 4.

17. A Concrete dam of trapezoidal section 15 m high and 3 m wide at top and 7 m wide at bottom. The water face is vertical and retains water up to 13 m. Check the stability of the dam for overturning, sliding and no tensile stresses are developed at the base, if the coefficient of friction of the dam material and soil is 0·6. Specific weight of concrete is 24 kN/m^3. Specific weight of water is 10 kN/m^3. Find the maximum and minimum stresses at base and show the stress distribution at the base.

18. Find the forces in the members *BC*, *BJ*, *AJ*, *CD*, *CI*, *IJ* and *CJ* of the pratt truss shown below by method of sections.



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