

c16-c-**302**

[Total Marks : 80

6223

BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY-2022

DCE - THIRD SEMESTER EXAMINATION

STRENGTH OF MATERIALS AND THEORY OF STRUCTURES

Time: 3 hours]

PART-A

- **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 4 mm thickness and 80 mm width is bent round a circular drum of 40 m diameter. Calculate the maximum stress due to bending, if $E = 200 \text{ kN/mm}^2$.
 - Sketch the shear stress distribution for homogeneous beam of

 (a) Rectangular section and (b) Symmetrical I-section.
 1¹/₂+1¹/₂=3
 - **3.** Distinguish between strength and stiffness. $1\frac{1}{2}+1\frac{1}{2}=3$
 - 4. Calculate the slope and deflection for a cantilever beam of span 4.5 m and carrying a UDL of 4 kN/m over its entire span. Take $E = 200 \text{ kN/mm}^2$ and $I = 156.5 \times 10^6 \text{ mm}^4$. $1\frac{1}{2}+1\frac{1}{2}=3$
 - **5.** Define principal stress and principal plane. 3

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- **6.** Define the following terms :
 - (a) Polar modulus
 - (b) Torsional rigidity
- A cylindrical shell of 2m diameter and 20mm thick is subjected to an internal pressure of 3 N/mm². Find the circumferential and longitudinal stresses developed in the material of the cylinder. 1¹/₂+1¹/₂=3
- 8. A mild steel column of 5m long and 50mm diameter is fixed at one end and free at other end. Determine the Euler's crippling load, if $E = 2 \times 10^5 \text{ N/mm}^2$.
- **9.** Differentiate between surcharge and surcharge angle. $1\frac{1}{2}+1\frac{1}{2}=3$
- **10.** Define the following terms : $1\frac{1}{2}+1\frac{1}{2}=3$
 - (a) Statically determinate frame
 - (b) Statically indeterminate frame

PART—B

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. A timber beam of rectangular section is simply supported over a span of 5m carrying a UDL of 30 kN/m over the entire span. Calculate the width and depth of the beam, if the bending stress is not to exceed 8N/mm². Take the ratio of depth to width a 1.5.
- 12. A 300mm deep, 150mm wide rolled steel joist of I-section with flanges 20mm thick, web 10mm thick is used as simply supported beam of span 5m. Find the UDL the beam can carry without exceeding the shear stress of 60N/mm².

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10

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11/2+11/2=3

3

2

- **13.** Derive the relation among curvature, slope and deflection of a loaded beam.
- **14.** A simply supported beam of span 6m carries a point load 10 kN
placed at a distance of 2m from right support. Determine the slope at
its ends and maximum deflection. Take $E = 200 \text{ kN/mm}^2$ and
 $I = 48 \times 10^6 \text{ mm}^4$. Use Macaulay's method.**5**+5=10
- **15.** An I-section of top and bottom flanges $200 \text{ mm} \times 20 \text{ mm}$ and web $20 \text{ mm} \times 360 \text{ mm}$ and 6 m long is used as a strut with both ends fixed. What is Euler's crippling load for the column? (Take $E = 2 \times 10^5 \text{ N/mm}^2$). 10
- **16.** A hollow cast iron column with hinged ends, supports an axial load of 800 kN. If the column is 7m long and has an external diameter of 300mm, find the thickness of metal required. Use Rankine's formula taking constants a = 1/1600 and $f_c = 320$ M/mm².
- 17. A masonry dam 8m high, 1.5m wide at top and 5m wide at bottom retains water to a depth of 7.5m. The water face of the dam is vertical. Find the maximum and minimum stresses at base. Specific weight of masonry is 22.4 kN/mm³ and specific weight of water is 10 kN/mm³. 10
- **18.** Determine the forces in the members *AB*, *AE*, *BE* and *BC* of truss shown in below figure (1) by method of joints : 10



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