* 4226 *

C14–C–302

4226

BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2016

DCE—THIRD SEMESTER EXAMINATION

MECHANICS OF SOLIDS

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. Draw neat sketches of three types of supports.

2. State the relation among the rate of loading, the shear force and the bending moment.

3. Draw the shear force and bending moment diagrams for a simply supported beam of span L meters and is loaded with a central point load of W kN.

4. Find the dimensions of the strongest rectangular beam that can be cut out of a round log of wood of diameter D.

5. Find the moment of resistance of rectangular beam of breadth 240 mm and depth 400 mm, if the bending stress is not to exceed 15 N/mm^2.

6. A wooden beam of rectangular section 200 mm×300 mm is used as simply supported beam over a span of 6 m. What safe u.d.l. the beam can carry if the shear stress in the beam section is not to exceed 5 N/mm^2?

7. A vertical mild steel post of 150 mm internal dia and 12 mm thick is 3·6 m long. It is fixed at the bottom and free at the top. A horizontal pull of 20000 N is applied at a point 2·6 m from the bottom. Find the deflection at the end. Take E 2 10^5 N/mm^2.

8. A simply supported beam of span 6 m carries a point load at the centre. If the slope at the ends is 1°, find the deflection under the load.

9. A cantilever of 3 m span carries two point loads of W each at a distance of 1 m and 2 m from the free end respectively. Find the maximum deflection due to this loading, if EI is the flexural rigidity.

10. State Mohr's theorems.

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)* Two point loads of 10 kN each act at 1/3rd span points on a simply supported beam of 9 m span. Sketch the shear force and bending moment diagrams and state the position of the beam where the bending moment is constant and maximum. 5

(b) Draw the shear force and the bending moment diagrams for a cantilever beam of span 6 m and is loaded with two concentrated loads of 10 kN and 4 kN placed at 2 m and 6 m respectively from the fixed end. 5

12. A beam of length 12 m is supported at left end and 2 m from the right end. It carries a uniformly distributed load of 3 kN/m on its entire 12 m length. Find the support reactions and draw the shear force and the bending moment diagrams indicating values at salient points. Also locate the point of contraflexure from its free end.

13. A timber beam is simply supported on 6 m span and carries a u.d.l. of 12 kN/m on the entire span. If the stress in the beam material is not to exceed 8 N/mm^2, design a suitable rectangular section making the depth twice its width.

14. A simply supported timber beam 100 mm wide, 200 mm deep carries a point load W at its mid-span. The permissible stresses in flexure and shear are 10 N/mm^2 and 1·5 N/mm^2 respectively. Calculate the span length of the beam ignoring the self-weight of the beam.

15. A wooden rectangular simply supported beam of length 6 m carries a u.d.l. of 10 kN/m over its entire length. Determine the section of the beam, if the central deflection is limited to 15 mm and the maximum bending stress is not to exceed 10 N/mm^2. Given E 10 kN/mm^2.

16. Two concentrated loads of 60 kN and 100 kN are placed on a simply supported beam of span 6 m at distances of 2 m and 3 m respectively from the left end. Determine the deflections under the two point loads, taking EI 3000 kN/m^2.

17. Calculate the minimum wall thickness of a thin cylindrical shell 1·2 m in diameter, if it has to withstand an internal pressure of 2 N/mm^2. The hoop stress is not to exceed 42 N/mm^2 and longitudinal stress not to exceed 32 N/mm^2. Take efficiencies of longitudinal and circumferential joints as 65% and 75% respectively.

18. *(a)* State the torsion equation for a circular shaft and explain the terms along with units. 4

(b) Determine the polar moment of inertia and the polar section modulus for a hollow circular shaft of external diameter 100 mm and thickness of metal 10 mm. 4

(c) Sketch the shear stress distribution diagram for a solid circular shaft. 2

★ ★ ★