

6022

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER / NOVEMBER—2023

DCE - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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. Two forces act at an angle of 120° . The bigger force is 50kN and the resultant is perpendicular to the smaller one. Find the smaller force. 3
2. Sketch and show the position of centroid of a trapezium with equal sloping on both sides. 3
3. Find the centroid of a triangle of base 100 mm and height 160 mm from the apex. 3
4. Find the moment of inertia of a hollow circular section whose external diameter is 60 mm and internal diameter is 50 mm about centroidal axes. 3
5. Define the terms : 3
 - (a) Poisson's ratio.
 - (b) Modulus of elasticity
 - (c) Resilience.

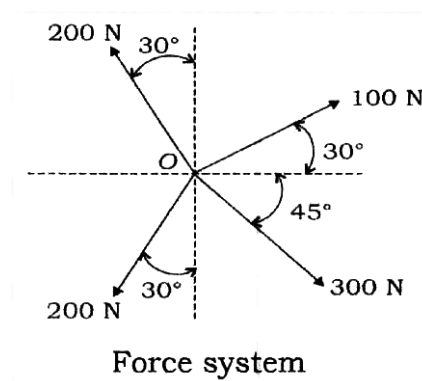
6. Draw the stress-strain diagram for a mild steel specimen subjected to a tensile force and indicate all the salient points. 3
7. Calculate the strain energy that can be stored in a steel bar 2.5 m long and 560 mm² cross-sectional area subjected to a tensile stress of 50 N/mm². Take $E = 2 \cdot 10 \times 10^5 \text{ N/mm}^2$. 3
8. Write the relationship between rate of loading, shear force and bending moment. 3
9. Define (a) Shear force (b) Bending moment. 1½+1½
10. A simple supported beam of span 7 m carries a uniformly distributed load of 10kN/m over the left-hand half of the span and a concentrated load of 20kN at a distance of 2 m from the right-hand support. Find the reaction at the supports.

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. A point is acted upon by a system of four forces as shown in the figure below. Find the magnitude and direction of the resultant of the force system.



12. Find the position of centroid of an I-section from the base when,

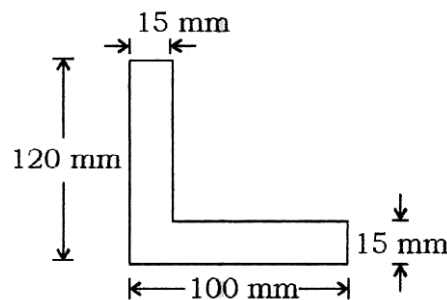
Top flange = 250 mm × 30 mm.

Web = 20 mm × 220 mm.

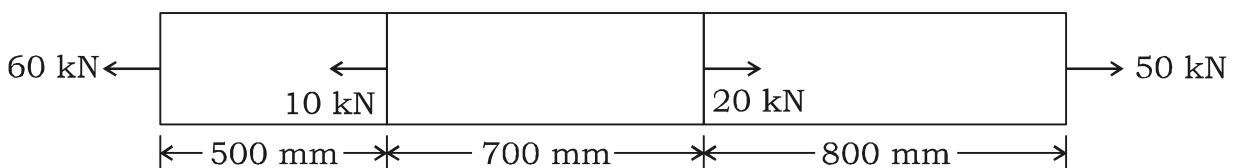
Bottom flange = 280 mm × 40 mm.

13. Find the moment of inertia of a rectangle 280 mm wide and 150 mm deep about its centroidal axes. Find also the least radius of gyration.

14. Determine the moment of inertia of an angle section shown below.

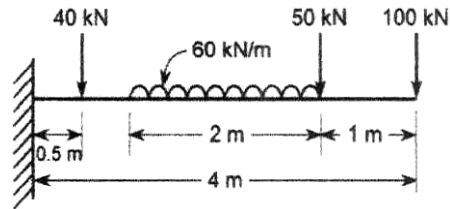


15. A steel bar 25 mm diameter is acted upon by forces as shown below. Find the total elongation of the bar. Take $E = 200 \text{ GPa}$.



16. A cylindrical bar is 25 mm in diameter and 1.4 m long. During a tension test, it is found that the longitudinal strain is 4 times the lateral strain. Calculate the shear modulus and bulk modulus, if the bar elongates by 0.06 mm under an axial tensile load of 60 kN.

17. A cantilever beam is loaded as shown below. Draw shear force and bending moment diagrams.



18. A simply supported beam 9 m long carries point loads of 15 kN, 12 kN and 10 kN at distances of 3 m, 5 m and 7 m respectively from left support. Draw the S.F and B. M diagrams.

★ ★ ★