

3016
BOARD DIPLOMA EXAMINATION, (C-09)
JUNE - 2019
*** DIPLOMA IN CIVIL ENGINEERING**
ENGINEERING MECHANICS
FIRST YEAR EXAMINATION

Time: 3 Hours**Total Marks: 80**

PART - A (10 x 3 = 30 Marks)

Note 1: Answer all questions and each question carries 3 marks

2: Answers should be brief and straight to the point and shall not exceed 5 simple sentences

1. Two forces of 80N and 70N act simultaneously at a point. Find the resultant force, if the angle between them is 150° .
2. List any three properties of a couple.
3. Give the position of Centroid of the following sections
 - a) Square
 - b) Rhombus
 - c) Semicircle
4. Define moment of inertia and state its units.
5. A bar of 1000 sq.mm in area is 2000 mm long. If a load of 75 kN is applied suddenly, what is the maximum instantaneous stress produced? Express its value in MPa.
6. The length of a rail in a railway track is 30 m at 25°C . Determine the temperature stress developed in the rail at 65°C , if there is no allowance for expansion. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $\alpha = 0.000012/^\circ\text{C}$.
7. A wooden strut 8 m long, 80 mm thick and 120 mm wide is subjected to an axial push of 45 kN. If the value of E is 10 kN/mm^2 , find the length of the strut after loading it.
8. Draw the sketches of
 - a) Cantilever beam with point load 'W'
 - b) Simply supported beam with UDL w/m throughout
 - c) Fixed beam with central point load 'W'
- * 9. A simply supported beam of span 6 m carries a central point load of 20 kN in addition to the UDL of 5 kN/m over its entire span. Draw the SF diagram.
10. A simply supported beam of span 6 m carries a UDL of 10 kN/m over its entire length. Draw the SF diagram.

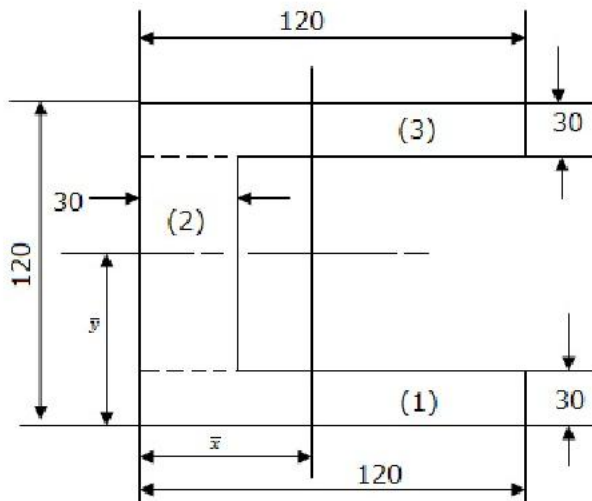
PART - B (5 x 10 = 50 Marks)

Note 1: Answer any five questions and each question carries 10 marks

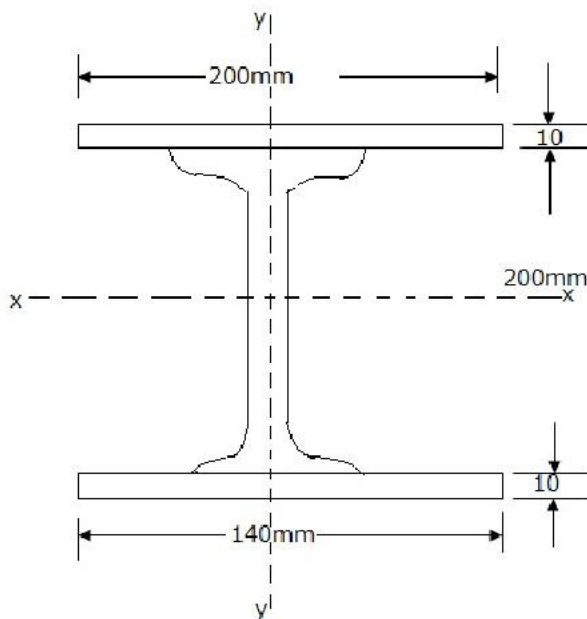
2: The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

11. a) State i) Parallelogram law of forces b) Triangle law of forces with neat sketches. 4M
 b) A uniform rod AB, 4m long, weight 100N is hinged at A. If the rod is kept in equilibrium in a horizontal position by a wire rope fixed at a point C, vertically 3m above the point A, find the tension in the rope. 6M

12. Find the position of centroid of a channel from base and left edge.

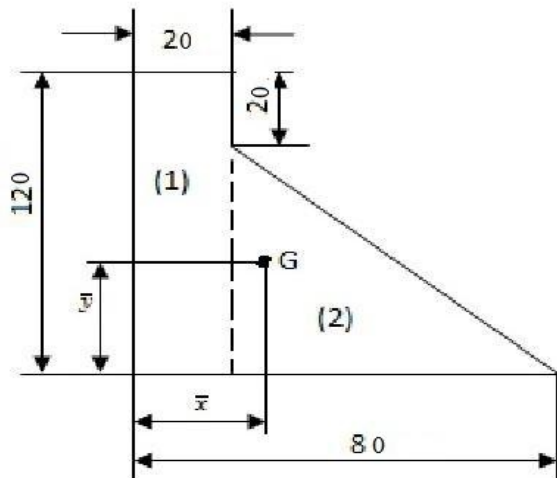


13. A mild steel R.S. joist 200×140 mm with one 200×10 mm plate symmetrically riveted to each flange is used as a stanchion. Find I_{xx} , I_{yy} and least radius of gyration for the compound section. Properties of R.S. Joist are, area of section $A = 3670 \text{ mm}^2$; $I_{xx} = 2624.5 \times 10^6 \text{ mm}^4$; $I_{yy} = 329 \times 10^6 \text{ mm}^4$.



14. a) Define
- Modulus of rigidity
 - Bulk Modulus
- 3 Marks
- b) A hollow cast iron column of square section has a metal thickness of 10 mm. If the maximum compressive stress is not to exceed 50 N/mm^2 , find the dimensions of the cross-section of the column to carry an axial compressive load of 500 kN. Also find the strain induced in it, if $E = 82 \text{ kN/mm}^2$ for cast iron. 7 Marks
15. A mild steel flat 150 mm wide \times 20 mm thick and 6 meters long carries an axial pull of 300 kN. If $E = 200 \text{ GPa}$, and Poisson's ratio = 0.26, calculate the change in length, width, thickness and volume of the flat.
16. A cantilever 6 m long is subjected to a UDL of 3 kN/m over a length of 2 m from the free end and another UDL of 2 kN/m over a length of 3 m from fixed end. Draw the S.F and B.M diagrams.

17. An overhanging beam ABC 8 m long is supported at end A and B, 6 m apart. The beam is subjected to UDL of 4 kN/m for a length of 4 m from the free end C and a point load of 2 kN at 1 m from the left hand support A. Draw S.F and B.M diagrams
- 18A. Determine the position of centroid of the trapezoidal section below. 5M



All the dimensions are in mm

- B. The moment of inertia of a triangular lamina about its base is $162 \times 10^6 \text{ mm}^4$. Find M.I of this triangle about an axis parallel to its base and passing through the centroid.

5Marks

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