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C16-C–106

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BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

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. What is couple? List the properties of a couple.

2. Define centroid and show the position of centroid for a figure semi-circle.

3. Differentiate between centre of gravity and centroid.

4. Define the following terms :

(a) Moment of inertia

(b) Polar moment of inertia

5. Draw stress – strain diagram for a mild steel specimen subjected to a tensile force and indicate all the salient points.

6. Explain the following terms :

(a) Working stress

(b) Factor of safety

7. Write the relationship among the elastic constants.

8. Define the following terms :

(a) Shear force

(b) Bending moment

9. What are the types of loadings on beams? Illustrate with the help of sketches.

10. Draw SFD and BMD for a cantilever carrying UDL throughout the span.

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. Four forces of 100 N, 200 N, 300 N and 400 N are acting at a point in the East, North-East, North-West and South-West directions respectively. Find the resultant and its direction.

12. Find the centroid of the I – section from the edge of bottom flange : given

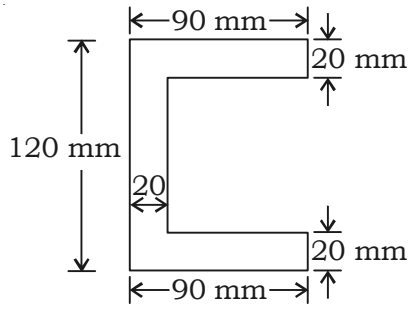
Top flange = 100 mm × 20 mm

Web = 20 mm × 240 mm

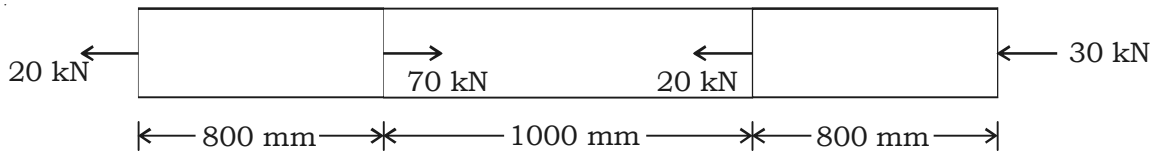
Bottom flange = 200 mm × 40 mm

13. Find the moment of inertia of an I – section with top flange 50 mm × 10 mm, bottom flange 100 mm × 10 mm and web 10 mm × 50 mm about centroidal X-X axis.

14. Find the moment of inertia of the section shown in the given figure about X-X axis passing through the centroid of the section.



15. Calculate the total change in length of the bar of 40 mm diameter given below. Take the value of Young's modulus as $1{\cdot}05 \times 10^5$ N/mm^2.



16. A bar 10 mm × 10 mm in cross-section and 400 mm long is subjected to an axial pull of 15 kN. The elongation in length and contraction in lateral dimensions are found to be 0·40mm and 0·0025mm respectively. Determine the Poisson's ratio, Young's modulus, rigidity modulus and bulk modulus of the material.

17. A cantilever beam of 3m long carries a UDL of 10 kN/m over a length of 1m from free end and a point load of 20kN is acting at a distance of 1 m from fixed end. Draw SFD and BMD.

18. A simply supported beam AB of span 5 m carries a UDL of 15 kN/m over a span of 2 m from right hand support. Draw SFD and BMD.

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