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C16-C–106

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BOARD DIPLOMA EXAMINATION, (C-16)

JUNE/JULY—2022

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. Find the magnitude and direction of a resultant of two forces 60N and 80N acting at a point with an included angle 50° between them. The force 80N being horizontal.

2. Define centre of gravity and centroid.

3. Find the centroid of a T-section, top flange 80×20 mm and web 20×120 mm.

4. Find the MI of an hollow circular section whose external dia 100 mm and internal dia 80 mm about centroidal axis.

5. A material has young's modulus of $1{\cdot}25\times10^5$ N/mm^2 and possion's ratio of 0·25. Calculate Modules of rigidity and Bulk modulus.

6. Define Young's Modulus, Possion's Ratio and Factor of Safety.

7. Calculate the strain energy that can be stored in a steel bar 2 m long and 500 mm^2 cross sectional area subjected to an instantaneous tensile stress of 50 N/mm^2. Take $E = 2 \times 10^5$ N/mm^2.

8. A simply supported beam of 5 m long has a point load of 20 kN at a distance of 3 m from LHS. Determine the maximum SF and BM.

9. Define the term point of contraflexure.

10. A cantilever beam 3 m long carries an u.d.l. of 5 kN/m over its entire span. Draw SFD and BMD.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

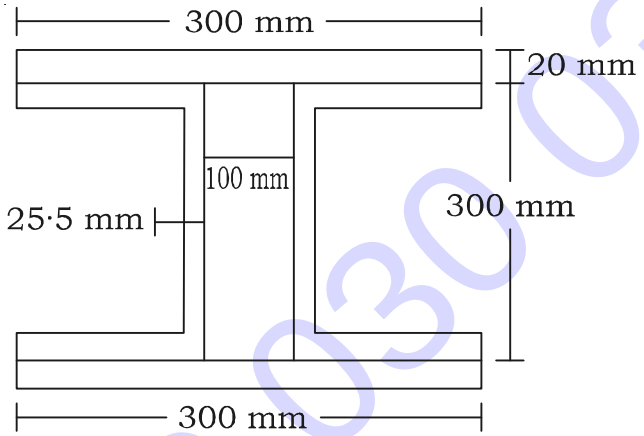
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* State Polygon law of forces and Lami's theorem. 2+2

(b) A pole is supported by a wire which exerts a pull of 720 kN at the top of the pole. If the wire makes and angle of 40° with the pole. Find the horizontal and vertical components of the pull. 6

12. Find the centroid of an unequal triangle of sides, 250 mm × 180 mm × 30 mm with its leg placed vertical.

13. A build-up section consists of two channels ISLC 300 placed back to back at 100 mm clear distance with two cover plates 300 mm × 20 mm connected one at top and other at the bottom. Determine the moment of Inertia and radius of gyration of the section about the horizontal and vertical axes. For single channel $I_{xx} = 6{\cdot}05 \times 10^7$ mm^4, $I_{yy} = 3{\cdot}46 \times 10^6$ mm^4; A = 4210 mm^2. Distance of C. G. from outer face of web $C_{yy} = 25{\cdot}5$ mm.

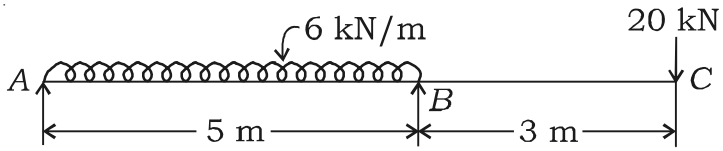


14. Find the moment of Inertial of a T-section having flange 180 mm × 60 mm and web 60 mm × 180 mm about XX and YY axes through the C. G. of the section.

15. A bar 12 mm × 12 mm and 500 mm long is subjected to an axial pull of 12 kN. If linear elongation is 0·40 mm and lateral contraction is 0·0025 mm. Determine possion's ratio, Young's Modulus, Modulus of Rigidity and Bulk Modulus.

16. A load of 500 N is applied on a steel wire of dia 2 mm and length 1·0 m. Calculate the strain energy stored in the material. If the same load is suddenly applied, calculate the strain energy absorbed. Take $E = 2 \times 10^5$ Mpa.

17. Draw the BM and SF diagrams for the overhanging beam carrying loads as shown in figure. Locate the point of contraflexure and determine the position and magnitude of maximum Bending Moment.



18. A horizontal beam 12 m long is simply supported at its ends and is subjected to vertical loads of 15 kN, 25 kN and 30 kN at 3 m, 7 m and 10 m from right support respectively. Draw Shear Force and Bending Moment diagrams indicating values at salient points.

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