



c16-c-106

6022

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER—2020

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours ]

Total Marks : 80

**PART—A**

- 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. State the law of parallelogram of forces. 3
2. Locate the position of centroid with neat diagram for the following : 1+1+1=3
  - (a) Semi-circle
  - (b) Rectangle
  - (c) Right angled triangle with one side vertical
3. A trapezoidal lamina has uniform batter on both sides. Its top width is 250 mm, bottom width is 350 mm and height is 700 mm. Determine the position of centroid from base. 3
4. Define radius of gyration and mention its units. 2+1=3
5. A mild steel rod of 15 mm diameter and 400 mm length elongates 0.20 mm under an axial pull of 13 kN. Determine the Young's modulus of the material. 3

- \* 6. Define Bulk Modulus and Modulus of Rigidity?  $1\frac{1}{2}+1\frac{1}{2}=3$
7. A material has Young's Modulus of  $1.25 \times 10^5$  MPa and Poisson's ratio of 0.25, calculate Modulus of Rigidity and Bulk Modulus?  $1\frac{1}{2}+1\frac{1}{2}=3$
8. What are the different types of end supports? Show any two of them with neat sketch. 3
9. Define the term shear force and bending moment at a section.  $1\frac{1}{2} \times 1\frac{1}{2}=3$
10. A simply supported beam 5 m in length and carries a point load of 40 kN at centre. Calculate the maximum shear force and bending moment. 3

### PART—B

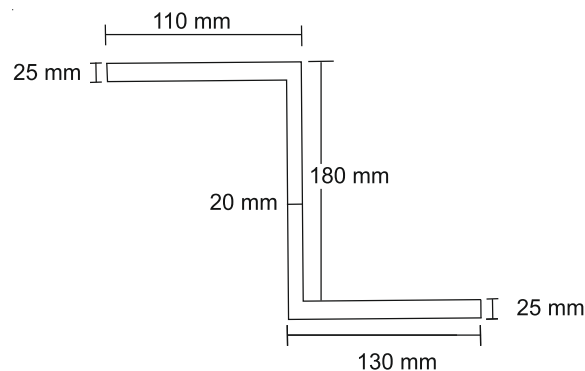
**Instructions :** (1) Answer *any five* questions.

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

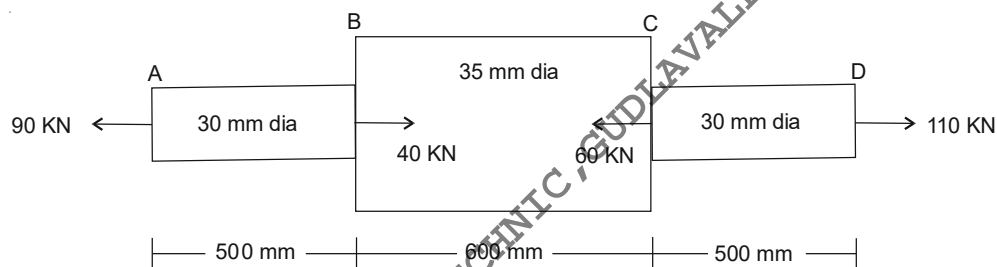
(3) Answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. A wheel has 5 spokes which are equispaced. The forces acting in three consecutive spokes are 12 kN, 14 kN and 10 kN. Find the forces acting in the other two spokes for the wheel to be in equilibrium.

12. Find the position of centroid of the section shown in figure.



- \* 13. Find the moment of inertia of the unequal angle section of size  $160 \text{ mm} \times 110 \text{ mm} \times 30 \text{ mm}$  about centroidal axes, with its longer leg placed vertical.
14. Find the moment of inertia of an I-Section with top flange  $90 \text{ mm} \times 15 \text{ mm}$ , bottom flange  $120 \text{ mm} \times 15 \text{ mm}$  and web  $15 \text{ mm} \times 110 \text{ mm}$  about its centroidal axes.
15. A copper bar  $40 \text{ mm}$  in diameter is rigidly attached at both ends to the inside of steel tube of  $50 \text{ mm}$  external diameter and  $5 \text{ mm}$  thick. Find the stresses in each metal of composite section length of  $1000 \text{ mm}$ , when it is subjected to an axial load of  $200 \text{ kN}$ . Take  $E_s = 200 \text{ GPa}$  and  $E_c = 100 \text{ GPa}$ .
16. A steel bar  $1.6 \text{ m}$  long is acted upon by forces as shown in fig. Find the elongation of the Bar  $E = 200 \text{ GPa}$ .



17. A cantilever beam  $6 \text{ m}$  long, carries three point loads of  $20 \text{ kN}$ ,  $30 \text{ kN}$  and  $60 \text{ kN}$  at  $2 \text{ m}$ ,  $3 \text{ m}$  and  $5 \text{ m}$  respectively from free end. Calculate shear force and bending moment and also draw SFD and BMD.
18. A simply supported beam of  $7 \text{ m}$  span carries an UDL of  $20 \text{ kN}$  per meter run over its entire span and also it carries two point loads of  $5 \text{ kN}$  and  $8 \text{ kN}$  at a distance of  $3 \text{ m}$  and  $5 \text{ m}$  from right hand support. Calculate shear force and bending moment and also draw SFD and BMD.

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