

**4019****BOARD DIPLOMA EXAMINATION, (C-14)****MARCH /APRIL-2019****DCE - FIRST YEAR EXAMINATION****ENGINEERING MECHANICS**

Time: 3 Hours

Max.Marks:80

**PART-A** **$10 \times 3 = 30M$** 

**Instructions :** 1) Answer **all** questions. Each question carries **three** marks.  
 2) Answer should be brief and straight to the point and shall not exceed five simple sentences

- 1) Write the units in SI System for the quantities given below.
  - a) momentum    b) section modulus    c) Luminous intensity
- 2) List the characteristics of a force.
- 3) Define couple and write the properties of couple.
- 4) Define centroid and centre of gravity.
- 5) Write the formula for centroid of the following figures.
  - a) Hemisphere    b) Right circular cone    c) Cylinder
- 6) (a) Define polar moment of inertia.  
     (b) Find the polar moment of inertia of circle, diameter 'd'.
- 7) Calculate the moment of inertia of an hollow circular section whose external diameter is 50 mm and internal diameter is 40 mm.
- 8) Define a) Stress b) Strain c) Poisson's ratio
- 9) Define a) Modulus of resilience b) Toughness c) Bulk modulus
- 10) The modulus of elasticity and modulus of rigidity of the material is 250kN/mm<sup>2</sup> and 100kN/mm<sup>2</sup>. Find bulk modulus.

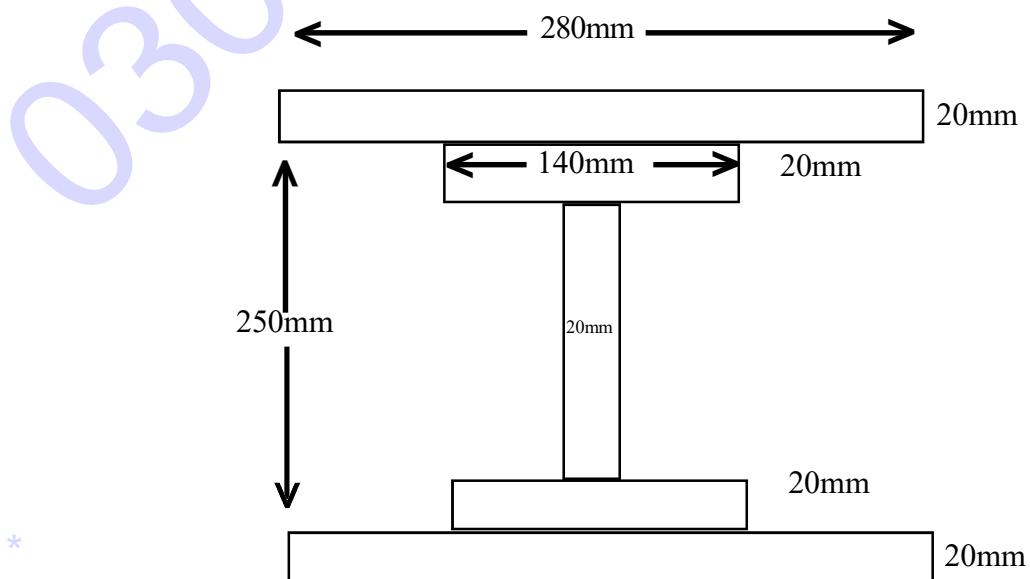
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## PART-B

**5x10=50M**

- Instructions:** 1) Answer any **five** questions.  
2) Each question carries **ten** marks.  
3) The answer should be comprehensive and the criteria for valuation is content but not the length of the answer.

- 11) A simply supported beam of span 4m carries a uniformly distributed load of 10 kN/m entire span and point load of 8kN acting at distance 1m from left end. Find the reactions at support.
- 12) a) State the parallelogram law of forces with neat sketches. (4)  
b) A body is acted upon by upward force of 100 N and a horizontal force of 200 N. Find the magnitude and direction of the resultant. (6)
- 13) Determine the position of centroid above the base of the built-up I section with top plate 200X20 mm; top flange 120X40mm; web 160X20 mm; bottom flange 200X40mm;
- 14) Find the moment of inertia of a rectangle 60mm wide and 120 mm deep about its centroidal axis. Find also the least radius of gyration.
- 15) A built up section is formed by an I section and two flange plate of size 280x20mm on each flange. Find the Moment of Inertia about centroidal axis XX and YY.



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- 16) (a) A load of 600 N applied on a steel wire of diameter 4mm and length 2m. Calculate the strain energy stored in the material if the load is applied gradually.
- (b) If the same load is suddenly applied, calculate the strain energy absorbed  $E=2\times 10^5 \text{ N/mm}^2$
- 17) A copper rod 35 mm diameter is enclosed within a steel tube of 40 mm dia internal and 45 mm dia external. The ends of the rod and tube are rigidly connected together. If the composite section is heated through  $80^\circ \text{ C}$ , what stresses will be developed in each?  
 $\alpha_s = 6 \times 10^{-6}/^\circ\text{C}$ ,  $\alpha_c = 10 \times 10^{-6}/^\circ\text{C}$ ,  $E_s = 200 \text{ GPa}$   $E_c = 120 \text{ GPa}$ .
- 18) The modulus of rigidity of a material is 30 GPa. A 8mm diameter rod of that material is subjected to an axial tensile force of 4kN and the change in its diameter is observed to be 0.002mm.  
Calculate the poisson's ratio and modulus of elasticity of the material.

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