C16-C-**105**

5016

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH / APRIL - 2019

DCE - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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

PART - A   **2×15=30**

Instructions :   (1)   *Answer any* **15** *questions.*
                          (2)   *Each question carries* **2** *marks.*
                          (3)   *Answer should be brief and straight to the point and shall not exceed five simple sentences.*

1   Define Engineering Mechanics.

2   State the Branches of Engineering Mechanics.

3   Define the term "Resultant".

4   State the law of parallelogram of forces and give expressions for magnitude and direction of the Resultant.

5   List various types of beams according to type of supports.

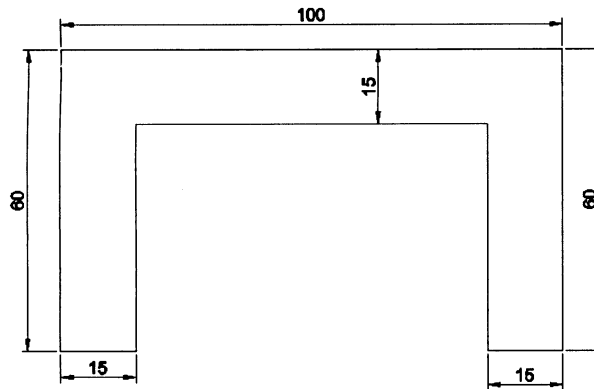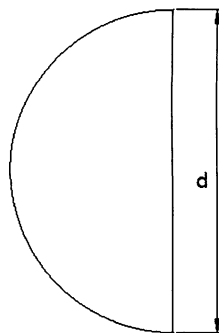6   Calculate the forces in the ropes AB and AC of the arrangement as shown below.
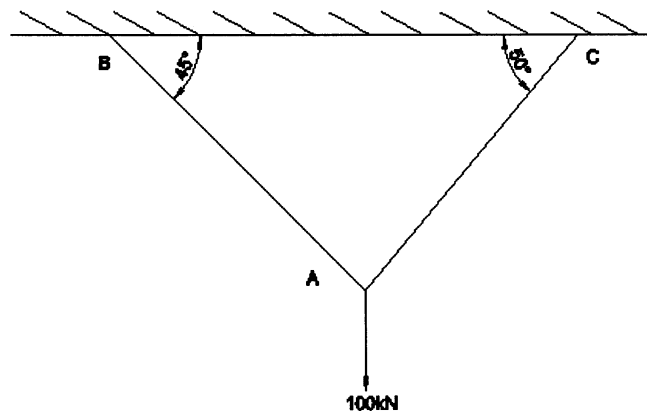
7   Distinguish between centroid and centre of gravity.

8   find the centroid of a channel section given below.

9   Locate the position of centroid for a semi circle as shown below with diameter, d.

10 State the parallel axis theorem with usual notations.

11 Define radius of gyration and give expression for it with usual notations.

12 Calculate least radius of gyration for a rectangle with dimensions of 230mm × 500mm.

13 The Moment of inertia of a triangle about its base is $150 \times 10^4 mm^4$, Find the M.I. of this triangle about its centroidal X-X axis.

14 A hollow shaft has an outside diameter 200mm and thickness 15mm. Determine the Polar moment of inertia.

15 Define the term "Strain Energy".

16 State "Hooke's law".

17 State the relationship among the Elastic constants.

18 Draw the stress strain diagram for a ductile material subjected to a tensile force and indicate any two salient points.

19 What pull elongates 5mm in a length of 2.0m of square rod of 25mm side, if its $E=210kN/mm^2$.

20 A rod is 3m long at 30°C. Find the expansion of the rod, when the temperature is raised to 100°C. Take $E=2\times10^5N/mm^2$, $\alpha=12\times10^{-6}$ per °C.

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PART - B   **10×5=50**

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

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

                     (3) Answer should be comprehensive and criterion for valuation is the content but not the length of the answer.
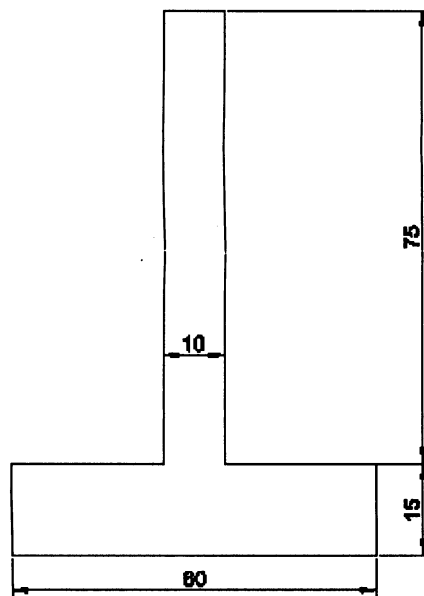
21 (a) Define "Equilibrium".   **2**

       (b) Calculate the Forces in the cables AB, BC, BD and DE   **8** of the system as shown in figure below.
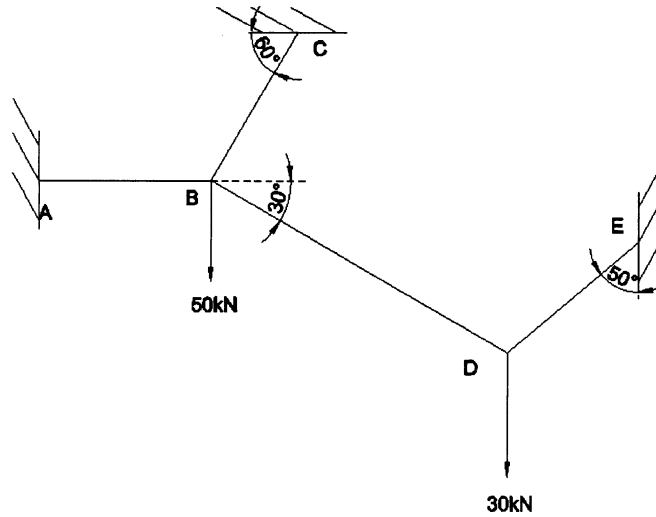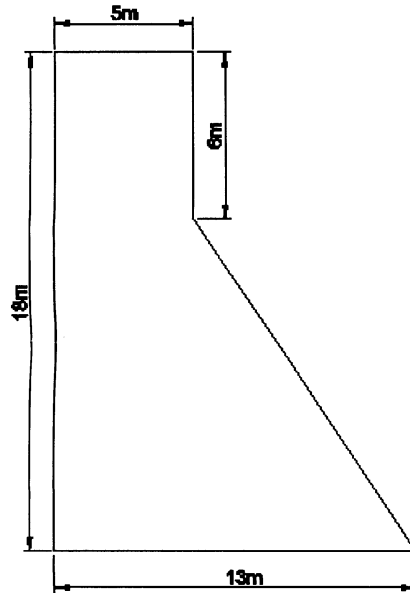
22 (a) Define "Couple" and state any four properties of couple. **5**

   (b) Four forces acting on a member as shown in Figure. **5**
   Find the values of F1 and F2, so that the member will
   be in equilibrium.
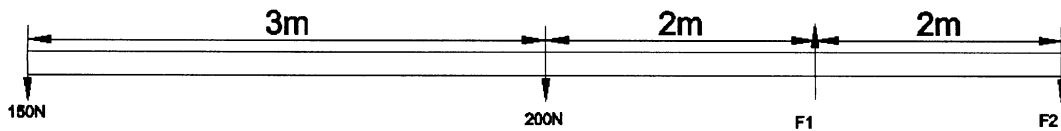
23 (a) Locate the centroid for the figure shown below. **5**

(b) Determine the position of centroid of a Dam section shown in Figure.   **5**

24 (a) Write the formula for the M.I. of a triangle about its base.   **2**

(b) Determine the moment of Inertia of the cross section of given unsymmetrical channel section about its centroidal X-X and Y-Y axes.   **8**
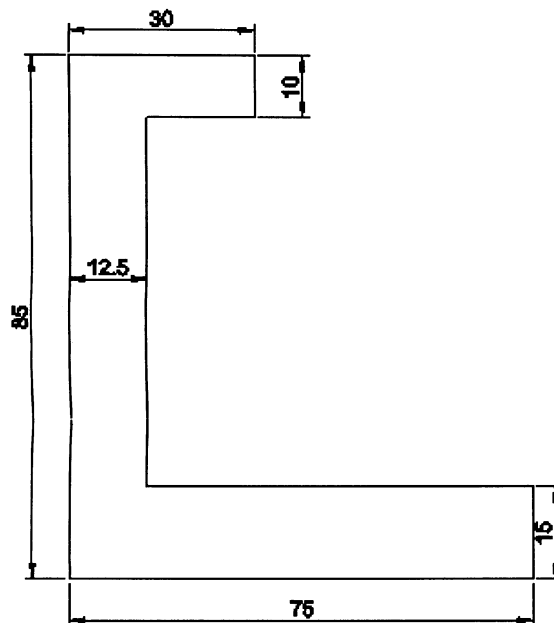
25   (a)   State "Perpendicular axis theorem".   **2**

     (b)   A Built -up section consists of two channels ISLC 300   **8** placed back to back at 80mm clear distance with two cover plates 320mm × 20mm. Determine the moments of inertia of the section about Horizontal and Vertical centroidal axes. For a single Channel, A=4210mm^2, Ixx=6.05×10^{7}mm^4, Iyy=3.46×10^{6}mm^4, Cyy=25.5mm.

26   (a)   Define (i) Poisson's ratio (ii) Modulus of Rigidity   **2**

     (b)   A circular R.C.C. Column 300mm in diameter is   **8** reinforced with 6 numbers of 25mm diameter Steel bars. Permissible compressive stress in concrete is 7 N/mm^2. Find the load carrying capacity of the column. Given modular ratio, m=13.33

27   (a)   Define "Bulk modulus"   **2**

     (b)   A mild steel bar 20mm in diameter and 250mm long is   **8** encased in a brass tube whose external dia is 32mm and internal dia is 22mm. This composite bar is heated through 90°C. Calculate the stress induced in each material. Take α for steel =12×10^{-6} per°C, α for brass = 19×10^{-6} per°C, E for steel = 210kN/mm^2 and E for brass =100kN/mm^2.

28 (a) Define (i) Ductility, (ii) Fatigue (iii) Creep   **3**

     (b) A bar 25mm in diameter and 500mm long is subjected   **7**
to an axial pull of 20kN. The elongation in length and
contraction in lateral dimension are found to be 0.5mm and
6×10^{-3}mm respectively. Determine the poisson's ratio,
Youngs Modulus, Modulus of Rigidity and Bulk Modulus.

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