NOTE: Section 1 is compulsory. Attempt any 2 questions from section 2. Assume suitable missing data, if any. Don't write any thing except roll no on the question paper. Mention your roll number on the answer sheet. Exchange of calculator is strictly prohibited.

SECTION 1

1 (a)   Find the unknown force 'F' if resultant is 40 N inclined at an angle of $60°$ with the second force 30 N force.   3 Marks

1 (b)   Schematically show the different type of supports and write down the equilibrium equation for each support.   2 Marks

1 (c)   Find The net moment at 'A' for the cantilever beam shown in Figure 1.   3 Marks

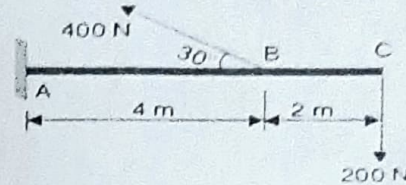Figure 1

1 (d)   While designing a Truss some of the members are included which doesn't participate in load bearing. What are those members called? What are the conditions for those members?   2 Marks

SECTION 2

2. (a)   A wire is fixed at two points A and D as shown in Figure 2. Two weights 20 kN and 25 kN are supported at B and C, respectively. When equilibrium is reached it is found that inclination of AB is $30°$ and that of CD is $60°$ to the vertical. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical.   5 Marks
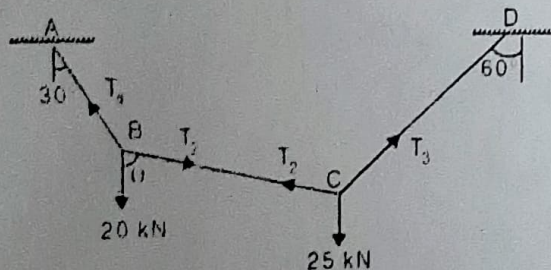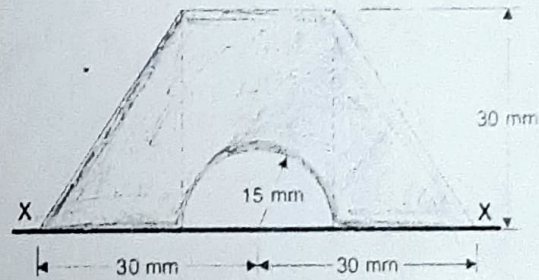

Figure 2

5 Marks

Figure 3

2 (b).   Find the centroid and moment of inertia about the **XX** axis of the section shown in Figure 3.   10 Marks
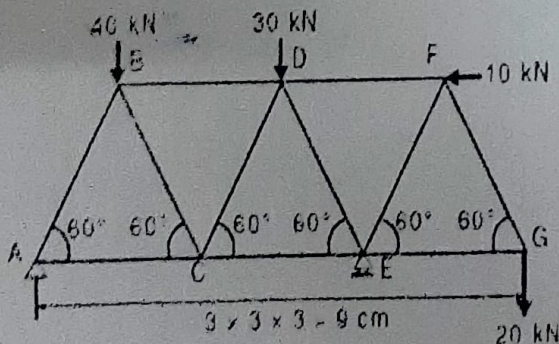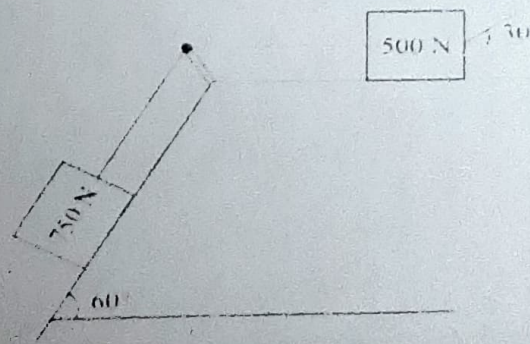

Figure 4

Figure 5

3.   The truss shown in, Figure 4 having all the members of 3 m length. Find the magnitude and direction of force in each member.

4. (a)   What is the value of P in the system shown in Figure 5 to cause the motion to impend? Assume the pulley is smooth and coefficient of friction between the other contact surfaces is 0.2   7 Marks

4 (b)   Explain the Coulomb's law of dry friction. Schematically show the static, limiting and kinetic friction.   3 Marks