F141

ES101

Enrol. No. ....

[ET]

END SEMESTER EXAMINATION : DECEMBER, 2023

ENGINEERING MECHANICS

Time : 3 Hrs.   Maximum Marks : 60

Note: *Attempt questions from all sections as directed. Use of Scientific non programmable calculator is allowed.*

SECTION – A   **(24 Marks)**

Attempt any **four** *questions out of* **five**.
Each question carries **06** *marks*.

1. Write the statements for parallelogram law of forces and polygon law of forces.

2. List the various types of loads to which a beam can be subjected. What sign conventions are normally adopted while plotting the SFD and BMD?

3. Determine the centroid of the area remaining after a circle of diameter r is removed from a circle of radius r as shown in figure.

4. A blocks of mass 50 kg, resting on a horizontal plane. Is required to be given an acceleration of $2 m/s^2$ towards right by applying a push P at an angle of $45°$ with the horizontal. Assuming that coefficient of friction between the block and plane is 0.4, work-out the magnitude of push P. Obtained your solution by D'Alembert's principle.

5. A uniform ladder of weight 250N and length 5m is placed against a vertical wall in a position where its inclination to the vertical is $30°$. A man weighing 800N climbs the ladder. At what position will be induced slipping? Take coefficient of friction as 0.2 at both contact surfaces of the ladder.

SECTION – B   (20 Marks)

Attempt any two questions out of three.
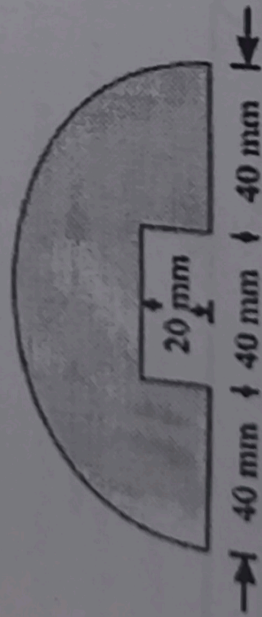
Each question carries 10 marks.

6. (a) Find the resultant of forces 2, $\sqrt{3}$, 5, $\sqrt{3}$ and 2 N that act at an angular point of regular hexagon towards the other angular points taken in order.   (5)

    (b) Define limiting friction, angle of repose, coefficient of friction and cone of friction.   (5)

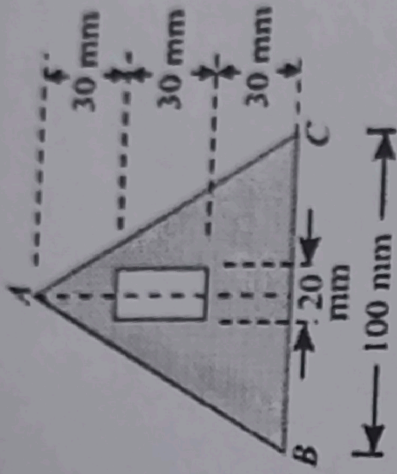7. (a) Draw the SFD and BMD of a beam loaded and supported as shown in figure.   (5)
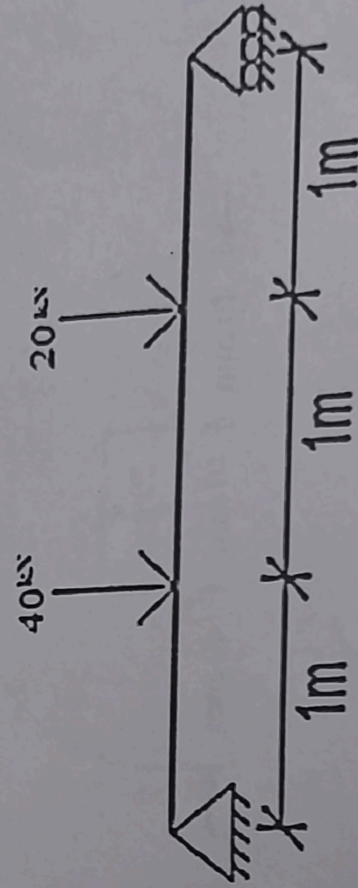
(b) A truss of span 10 meters is loaded as shown in Figure. Find the forces in member CD, CE and AE by using method of section. (5)

(16 Marks)

SECTION – C
(Compulsory)

8. (a) Locate the centroid of shaded area (4)

(b) A rectangular hole is made in a triangular section as shown in Figure. Determine the moment of inertia of the section about X-X axis passing through its centre of gravity (6)
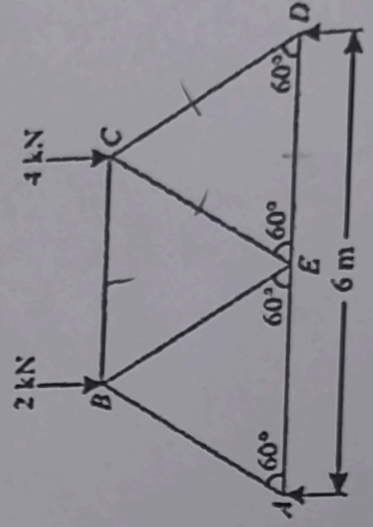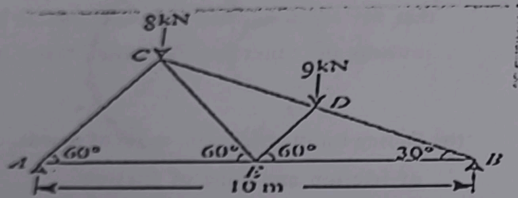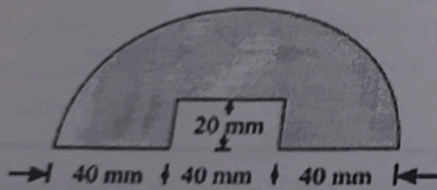
9. (a) Define D' Alembert's principle (2)

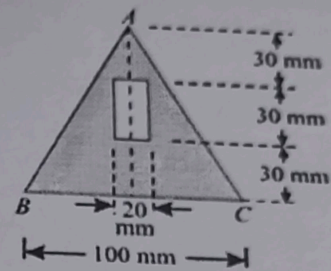(b) Find the force in each member of truss shown in figure (8)

(b) A truss of span 10 meters is loaded as shown in Figure. Find the forces in member CD, CE and AE by using method of section.   (5)
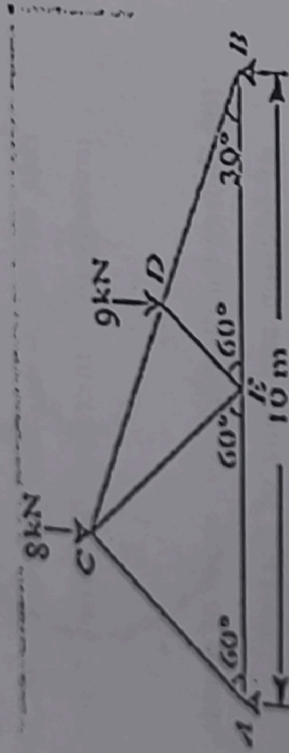
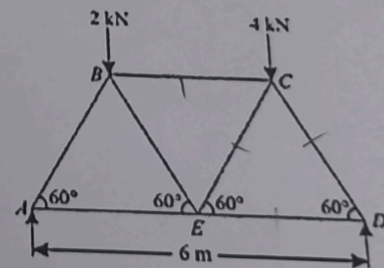8. (a) Locate the centroid of shaded area   (4)

(b) A rectangular hole is made in a triangular section as shown in Figure. Determine the moment of inertia of the section about X-X axis passing through its centre of gravity   (6)

SECTION – C   (16 Marks)

(Compulsory)

9. (a) Define D' Alembert's principle   (2)

(b) Find the force in each member of truss shown in figure   (8)

(c) Using Pappus Guldinus Theorem, calculate the volume of a sphere of radius r.   (6)