[No. of Printed Pages – 8] **3079**

ES101 Enrol. No.

[ET]

END SEMESTER EXAMINATION : JANUARY, 2025

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. State and explain Lamiâ€™s theorem with application.

2. Describe and explain different types of trusses. Also write the assumptions made for analysis of truss.

P.T.O.

3. Explain Pappus Guldinus theorem and determine the centroid of semi-circular sector of radius 'r'.

4. State and explain D'A lembert's principle and it's application in moving connected bodies.

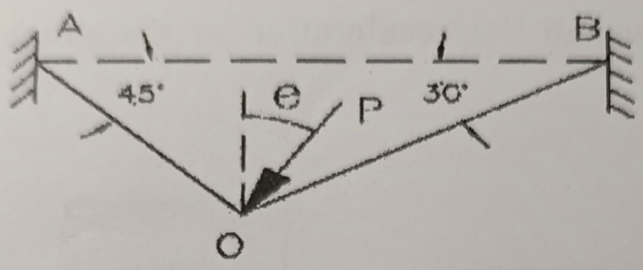
5. Explain angle of friction, angel of repose and cone of friction with neat diagram.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three**.

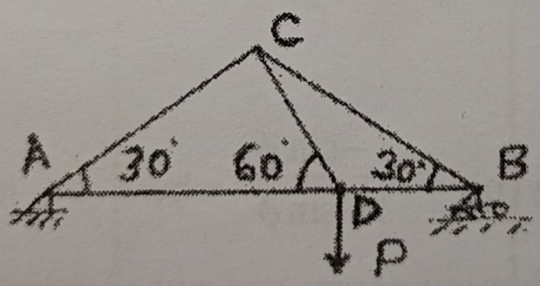
Each question carries **10** *marks.*

6. (a) A force "P" is applied at 'O' as shown in fig. below, if the tension in string AOB is 100N determine the force P in magnitued and direction.



(5)

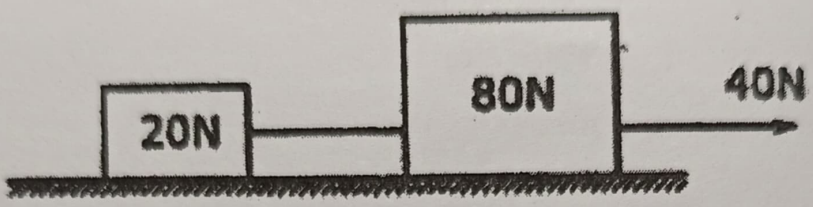
(b) Find the force in the member CD of the truss as shown in the fig.



(5)

7. (a) Two weights 20N and 80N are connected by a string and move along a rough horizontal plane under the action of 40N pull as shown in the figure below. The coefficient of friction between all

surfaces is 0.25. Determine the tension in the string and the acceleration of the weights.



(5)

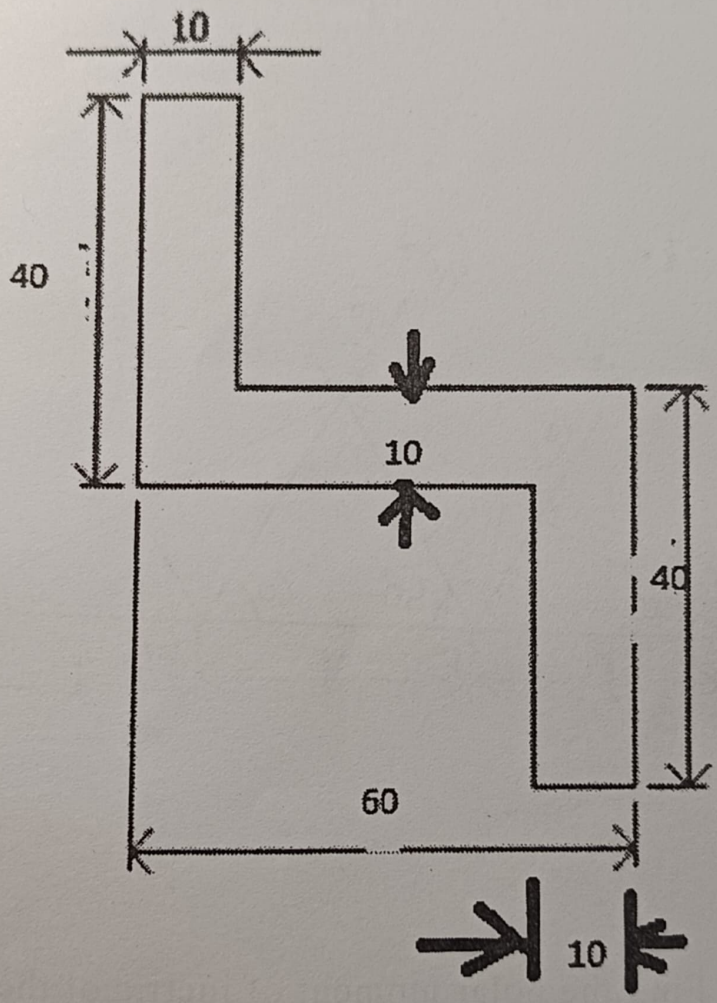
(b) Derive the expression for maximum efficiency of a screw jack given by:

$$\text{Efficiency}(\eta) = \frac{1-\sin\phi}{1+\sin\phi}$$ where ϕ, is angle of limiting friction screw and nut material.

(5)

8. (a) State and explain parallel axis and perpendicular axis theorem for moment of inertia. (5)

(b) Determine the center of gravity of the cross section as shown in fig. (all dimensions are in mm)



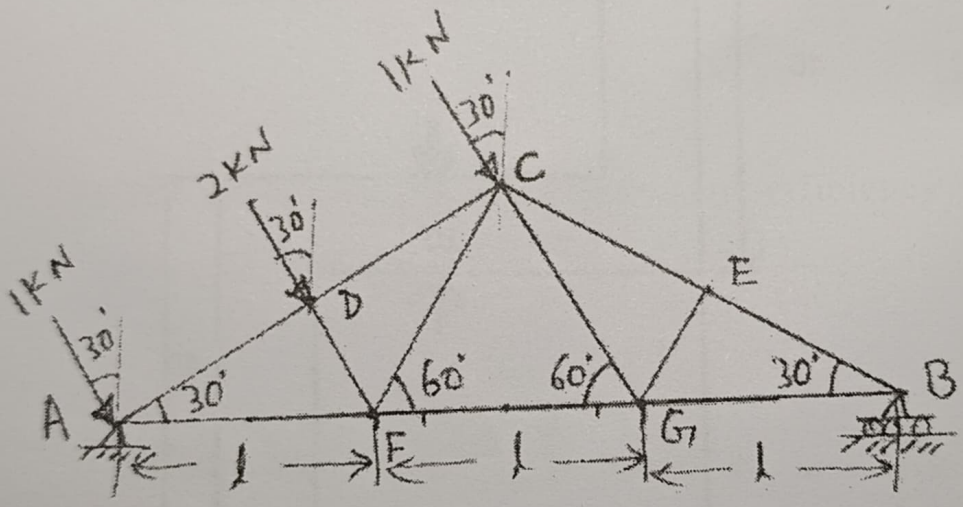
(5)

P.T.O.

SECTION – C (16 Marks)

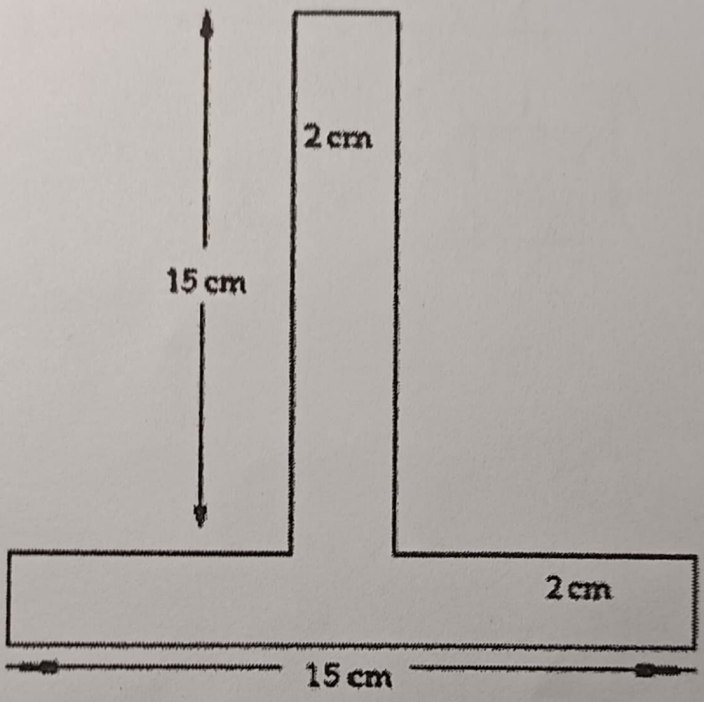
(Compulsory)

9. (a) Determine the forces in each member of the truss as shown in the figure below.



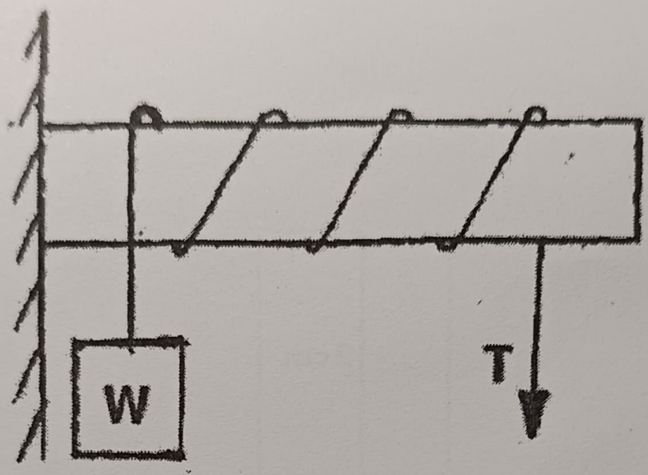
(6)

(b) Find the polar moment of inertia of the inverted T section about its centroid as shown in the figure.



(6)

(c) A rope is wrapped around the rod as shown in the fig. Determine the force required at the free end of rope to stop the load W = 250kN, Take μ = 0.3



(4)