Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

MECHANICS OF SOLIDS [CIE 1071]

Marks: 30 **Duration: 90 mins.**

A

Answer all the questions. Section Duration: 20 mins

Select the correct answer for the following questions

1) A 500 N force is applied at an angle of 30^o w.r.t the horizontal, on a body. If $\sum F_y=0$, what horizontal force is required to keep the body in equilibrium?

(1)

250 N | 433 N | 500 N | 866 N

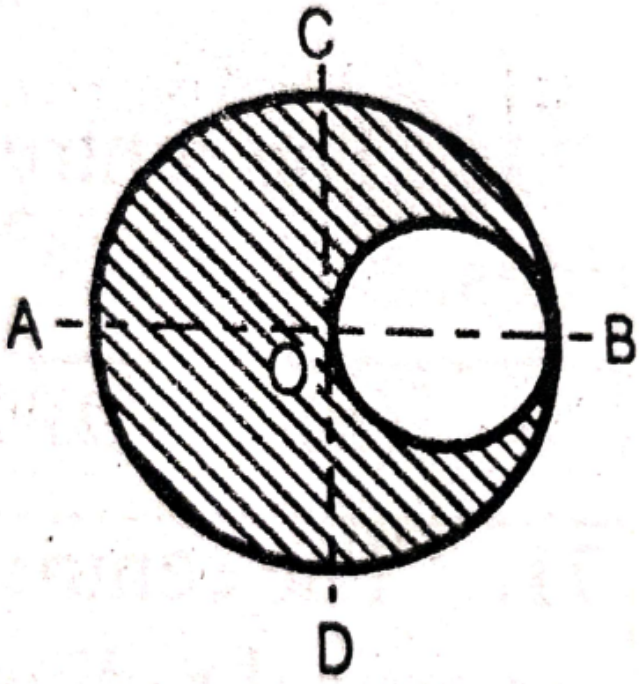
2) The effect of a couple on a rigid body depends on:

The magnitude of the forces.	The distance between the lines of action of the forces.	Both magnitude of the forces and the distance between their lines of action.	Only the direction of forces.

(1)

3) A circular hole of 50 mm diameter is cut out from a circular disc of 100 mm diameter as shown in figure below, the centroid of the section will lie _____.

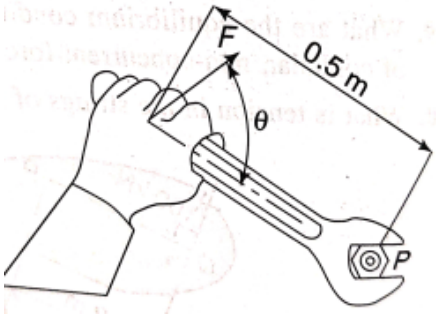
(1)



inside the shaded area | inside the hole | at O | outside the shaded area

4) A moment of 100 N-m about point P is required to tighten the nut. Determine the smallest magnitude of the force F and the corresponding angle θ that will turn the nut as shown in Figure below

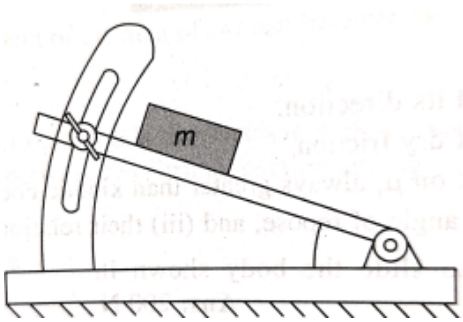
(1)



20 N, 90° | 200 N, 90° | 2000 N, 90° | 2 N, 90°

5) Find the inclination of the block in Figure below, at which it will start to slip down if the coefficient of friction between the block and the surface is 0.24

(1)



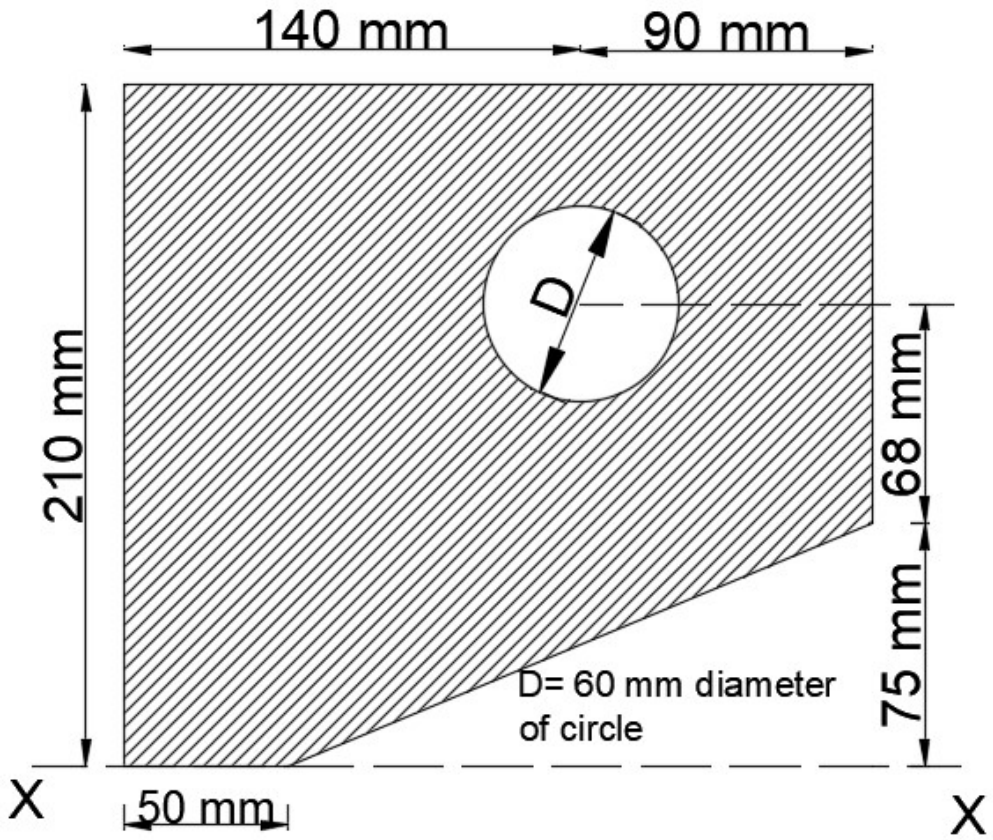
1.349° 13.49° 67.48° 6.748°

B

Answer all the questions.

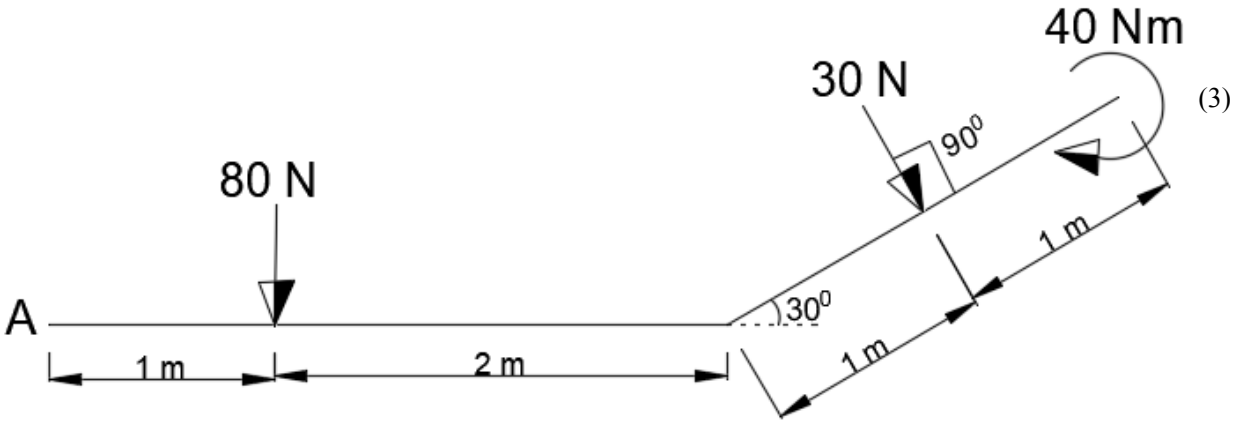
Answer all the questions.Any missing data can be assumed suitably with proper reasoning.

6) Locate the centroid of the shaded area with respect to the XX axis shown in the figure.



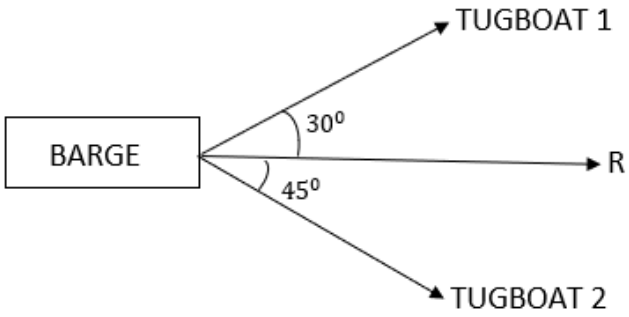
(4)

7) Locate the resultant of the force system shown in the figure w.r.t "A".



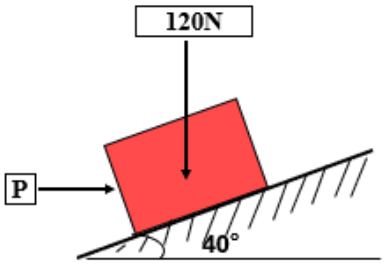
(3)

8) A barge is pulled by two tugboats as shown in the figure. The tugboats must exert a resultant (R) force of 8000 N, along the direction of motion of the barge. Determine the tension in each rope.



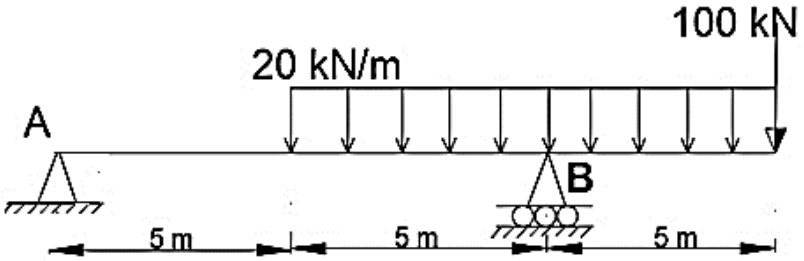
(3)

9) Compute the magnitude of P that will cause the motion to impend up the plane. Coefficient of friction, μ = 0.25.



(3)

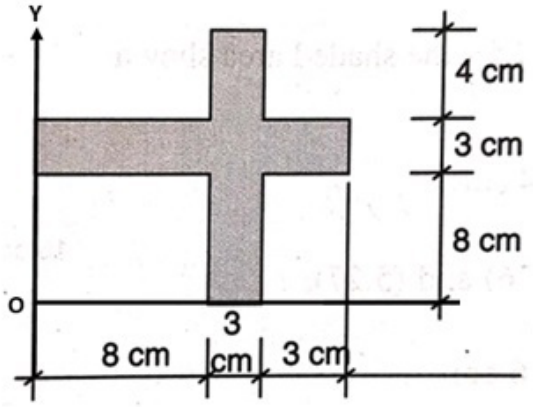
10) Find the support reactions for the overhanging beam loaded as shown in the figure.



(3)

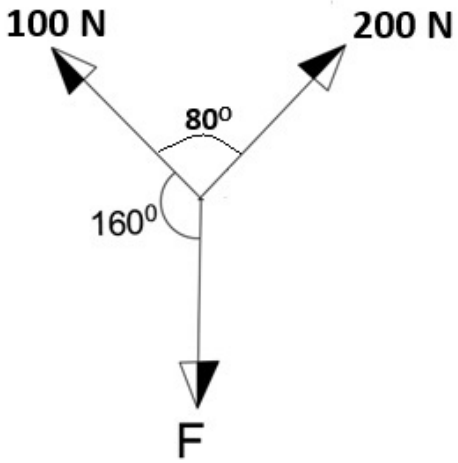
11) Obtain the expression of centroid **($\bar{y}$)** w.r.t base for the right-angle triangle of base B and height H from the principle of moments. (3)

12) Locate the centroid for the shaded area w.r.t the axis OY as shown in figure.



(2)

13) Determine the value of F in the figure shown below, assuming the given force system is in equilibrium.



(2)

14) State any four properties of a couple in system of forces. (2)