

B. Tech Degree I Semester Examination in Naval Architecture and Ship Building December 2010

ST 105 ENGINEERING MECHANICS I

Time : 3 Hours

Maximum Marks : 50

PART - A

(Answer **ALL** questions)

(All questions carry **EQUAL** marks)

(5 x 2 = 10)

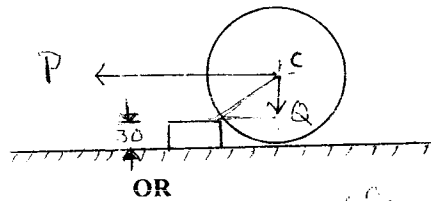
- I. (a) State the laws of friction.
 (b) How will you resolve a given force into a force and a couple?
 (c) Define "Radius of Gyration".
 (d) In analysis of plane trusses, when do you prefer method of section to method of joints?
 (e) What is principle of virtual work?

PART - B

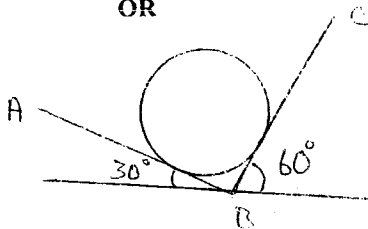
(All questions carry **EQUAL** marks)

(5 x 8 = 40)

- II. Determine the magnitude of a horizontal force 'P' applied at the centre of roller C of weight $Q = 100\text{ N}$ and radius $R = 150\text{ mm}$ which will be necessary to pull it over a 30 mm curb.

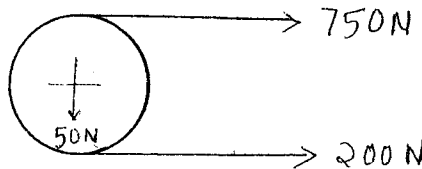


III.



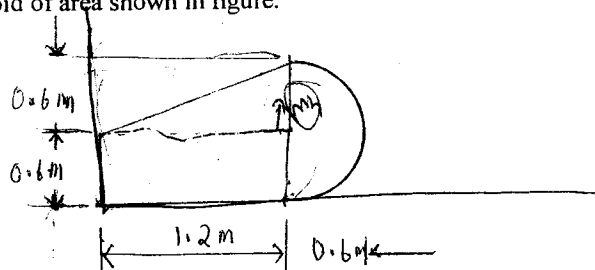
A ball of weight 12 N rests in a right angled trough as shown. Determine the forces exerted on the sides of the trough, if the surfaces are perfectly smooth.

Determine the resultant of the three forces acting on the pulley as shown in figure. The diameter of the pulley is 4 m .

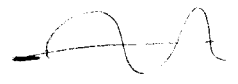


OR

- V. Locate the centroid of area shown in figure.



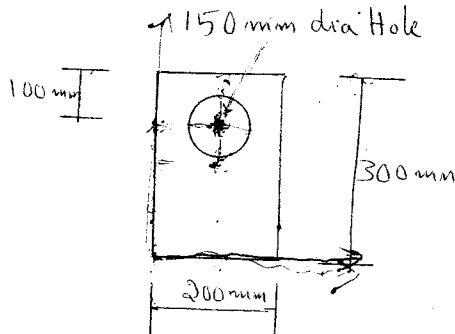
(P.T.O.)



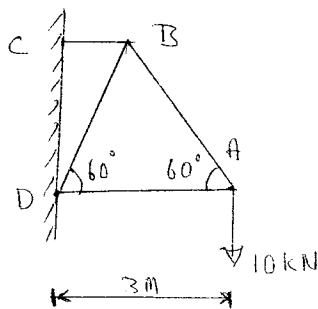
Derive an expression for moment of inertia of a triangular section.

OR

Find the moment of inertia of a hollow section shown below, about an axis passing through the centre of gravity.



VIII.



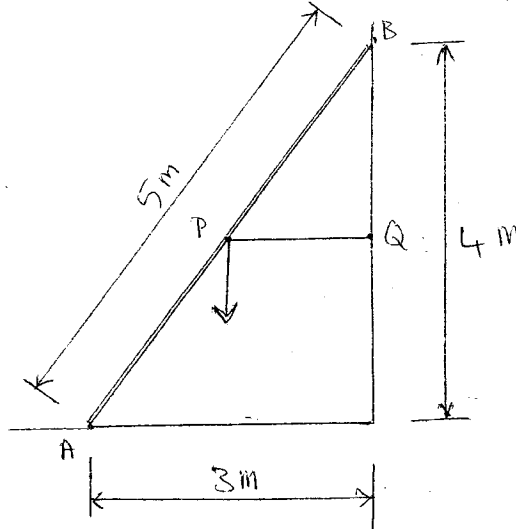
A cantilever truss of 3 m span is loaded as shown in figure. Find the forces in the various members of the framed truss and tabulate the result.

OR

IX.

A cable 20 meters long weighs 25 N/m. It hangs between two points A and B at the same level. If the central dip of the cable is 5 meters, find the distance between two supports. Also find the maximum tension in the cable.

X.



A uniform ladder 5 m long and weighing 200 N, rests on a smooth floor at 'A' and against a smooth wall at 'B'. A horizontal rope PQ prevents the ladder from slipping. Using the method of virtual work determine the tension in the rope.

OR

XI.

The line of action of three forces 178 N, 4405 N and 133.5 N are concurrent at the origin and pass through the points having co-ordinates (-1, +2, +4), (+3, 0, -3) and (+2, -2, +4) respectively. Find the magnitude and direction of their resultant.