Code No: R13110 **R13** SET - 1

I B. Tech I Semester Supplementary Examinations, Nov/Dec - 2017
ENGINEERING MECHANICS
(Com to CE,ME,CSE,PCE,IT,Chem E, Aero E,AME,Min E, PE, Metal E, Textile Engg)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) State and prove the Lami's theorem with help of neat sketch. (4M)

b) State the principle of super position. (3M)

c) State Pappus-Guldinus theorem I. (4M)

d) Define the terms: (3M)
i. Radius of gyration and
ii. Product of inertia.

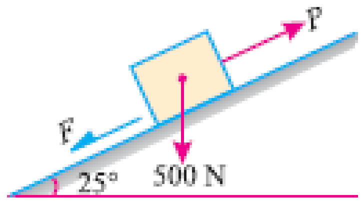
e) What is general plane motion? (4M)

f) What is the importance of impulse momentum equation? Explain in brief. (4M)

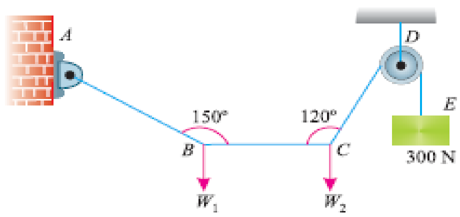
PART -B

2. a) The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. (8M)

b) A body of weight 500 N is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by an effort (P) parallel to the plane as shown in Figure below. Determine the minimum and maximum values of P, for which the equilibrium can exist, if the angle of friction is 20°. (8M)



3. a) A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Figure below. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2. (8M)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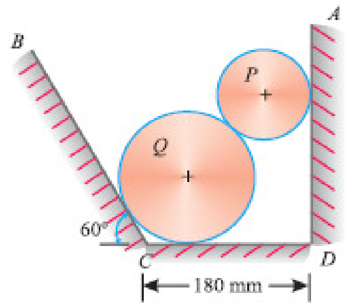
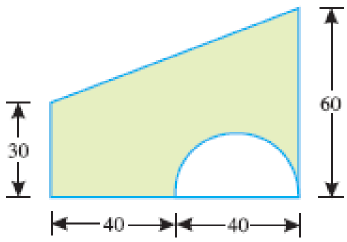
b) Two cylinders P and Q rest in a channel as shown in Figure below. The cylinder P has diameter of 100 mm and weighs 200 N, whereas the cylinder Q has diameter of 180 mm and weighs 500 N. The bottom width of the box is 180 mm, with one side vertical and the other inclined at 60°, determine the pressures at all the four points of contact. (8M)

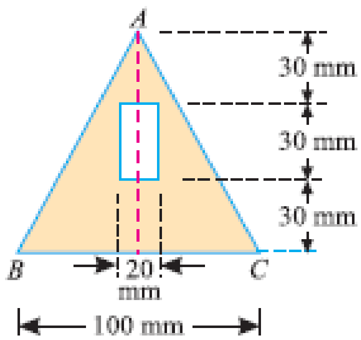


4\. a) A body consisting of a cone and hemisphere of radius r fixed on the same base rests on a table, the hemisphere being in contact with the table. Find the greatest height of the cone, so that the combined body may stand upright. (10M)

b) A semicircular area is removed from a trapezium as shown in Figure below (dimensions in mm). Determine the centroid of the remaining area (shown shaded). (6M)



5\. A rectangular hole is made in a triangular section as shown in Figure below. Determine the moment of inertia of the section about X-X axis passing through its centre of gravity and the base BC. (16M)



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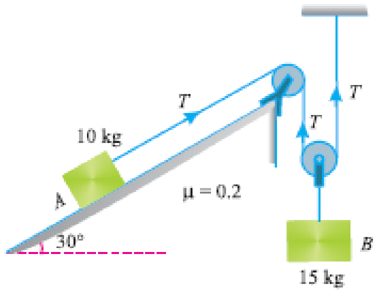
6. a) A shot is fired with a velocity if 30 m/s from a point 15 metres in front of a vertical wall of 6 metres high. Find the angle of projection, to the horizontal for the shot just to clear the top of the wall. (6M)

b) Determine the resulting motion of the body A assuming the pulleys to be smooth and weightless as shown in Figure below. If the system starts from rest, determine the velocity of the body A after 10 seconds. (10M)



7. a) An engine of mass 50 tonnes pulls a train of mass 300 tonnes up an incline of 1 in 100. The train starts from rest and moves with a constant acceleration against a total resistance of 50 newtons per tonnes. If the train attains a speed of 36 km.p.h. in a distance of 1 kilometre, find power of the engine. Also find tension in the coupling between the engine and train. (10M)

b) A truck of mass 15 tonnes travelling at 1.6 m/s impacts with a buffer spring, which compresses 1.25 mm per kN. Find the maximum compression of the spring. (6M)