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

I B. Tech I Semester Supplementary Examinations, May. - 2018
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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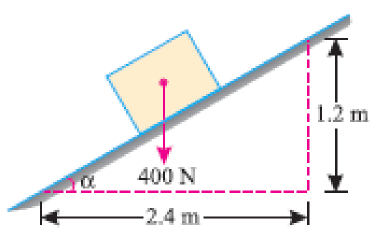
PART –A

1. a) What is meant by angle of repose? Explain with a Sketch. (4M)
   b) State Newton's first Law. (3M)
   c) State and explain Pappus-Guldinus theorem II. (4M)
   d) What do you understand from perpendicular axis theorem? (3M)
   e) Explain D'Alembert's principle with neat sketch. (4M)
   f) What is the importance of work energy equation? Explain in brief. (4M)

PART -B

2. a) The following forces act at a point : (8M)
   (i) 20 N inclined at 30° towards North of East,
   (ii) 25 N towards North,
   (iii) 30 N towards North West, and
   (iv) 35 N inclined at 40° towards South of West.
   Find the magnitude and direction of the resultant force.

   b) An inclined plane as shown in figure below is used to unload slowly a body weighing 400 N from a truck 1.2 m high into the ground. The coefficient of friction between the underside of the body and the plank is 0.3. State whether it is necessary to push the body down the plane or hold it back from sliding down. What minimum force is required parallel to the plane for this purpose? (8M)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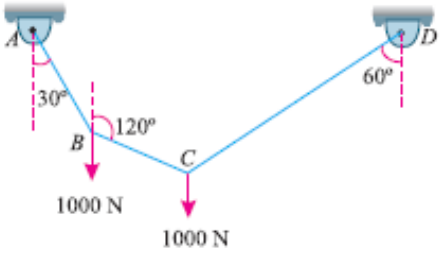
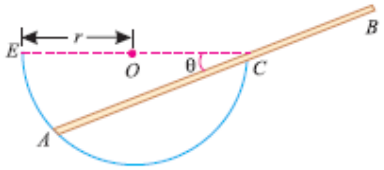
3. a) A string ABCD, attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in Figure below. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120°. (8M)

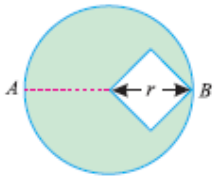


b) A uniform rod AB of length *3r* remains in equilibrium on a hemispherical bowl of radius *r* as shown in figure below. Ignoring friction find the inclination of the rod (θ) with the horizontal. (8M)

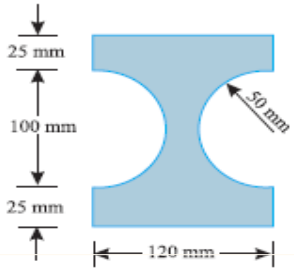


4. a) A right circular cylinder of 12 cm diameter is joined with a hemisphere of the same diameter face to face. Find the greatest height of the cylinder, so that centre of gravity of the composite section coincides with the plane of joining the two sections. The density of the material of hemisphere is twice that the material of cylinder. (10M)

b) A square hole is punched out of circular lamina, the diagonal of the square being the radius of the circle as shown in figure below. Find the centre of gravity of the remainder, if *r* is the radius of the circle. (6M)

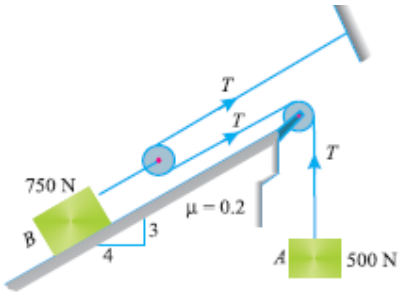


5. Figure below shows the cross-section of a cast iron beam. Determine the moments of inertia of the section about horizontal and vertical axes passing through the centroid of the section. (16M)



6. a) A bullet is fired upwards at an angle of 30° to the horizontal from a point P on a hill, and it strikes a target which is 80 m lower than P. The initial velocity of bullet is 100 m/s. Calculate the actual velocity with which the bullet will strike the target. (6M)

   b) The system of bodies shown in figure below starts from rest. Determine the acceleration of body B and the tension in the string supporting body A. (10M)



7. A wagon of mass 50 tonnes, starts from rest and travels 30 metres down a 1% grade and strikes a post with bumper spring as shown in figure below. If the rolling resistance of the track is 50 N/t, find the velocity with which the wagon strikes the post. Also find the amount by which the spring will be compressed, if the bumper spring compreses 1 mm per 20 kN force. (16M)