Code No: R13210 | **R13** | **SET-1**

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2019
ENGINEERING MECHANICS
(Com. to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

Time: 3 hours | Max. Marks: 70

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

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PART –A

1. a) What is meant by limiting friction and impending motion? (4M)

b) Differentiate between resultant and equilibrant. (3M)

c) Discuss the differences between centre of gravity and Mass centers. (3M)

d) Differentiate between polar moment of inertia and product of inertia. (3M)

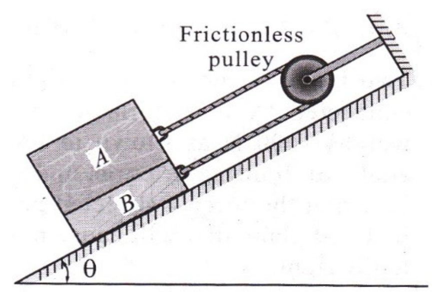
e) How to find the total kinetic energy of the body, if the body has both translation and rotational motion. (5M)

f) Discuss the advantages of work-energy theorem. (4M)

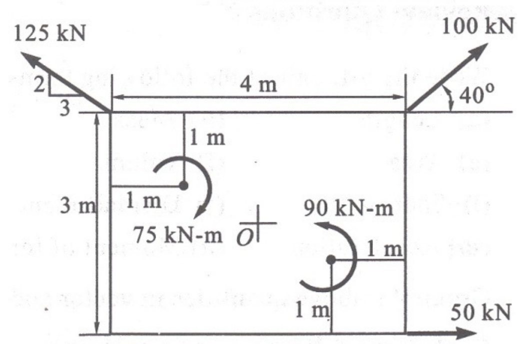
PART –B

2. a) Three collinear horizontal forces of magnitude 150N, 450N and 300N are acting on a rigid body. Determine the resultant of forces when (7M)
(i) all the forces are acting in the same direction;
(ii) the force of 300N act in the same direction.

b) Block A has a mass of 20 kg and block B has a mass of 10 kg in the figure. Knowing that μ_s=0.15 between all surfaces of contact, determine the value of Θ for which motion will impend. Take acceleration due to gravity = 10 m/s^2. (9M)



3. a) Find the sum of moment about center O of the force and couple acting on the rectangle plate as shown in the figure. (7M)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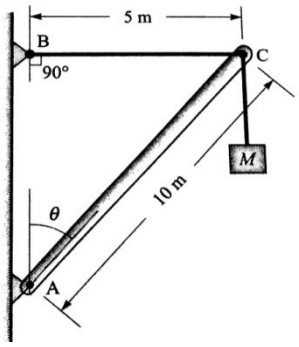
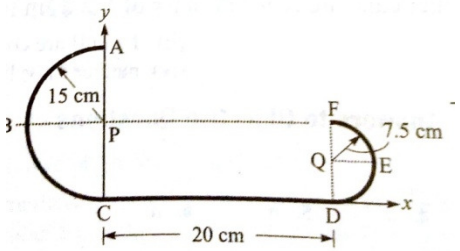
b) A 10 m boom supports a load of 600 kg, as shown in the figure. The cable BC is horizontal and 10 m long. Determine the forces in the boom and the cable. (9M)



4. a) Determine the volume generated by rotating a semi-circular area of radius `r` about a non-intersecting axis using Pappus theorem. (7M)

b) A wire has been bent into the shape as shown in figure. Determine the position of centroid of the wire. (9M)

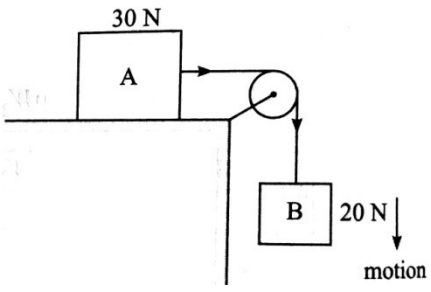


5. a) Find the moment of inertia values of a semi-circle of radius 50mm about its centroidal XX and YY axes. (8M)

b) Determine the mass moment of inertia of a cylinder shaft of 100mm diameters and 2.5m height about the centre of gravity axes.(density, ρ=8000 kg/m^3). (8M)

6. a) A train is uniformly accelerated and passes successive kilometer-stones with velocities of 18kmph and 36kmph, respectively. Calculate the velocity when it passes the third kilometer-stone. Also, find the time taken for each of the two intervals of one kilometer. (8M)

b) Two blocks shown in figure have weights A=30N and B=20N and coefficient of friction between block `A` and horizontal surface is 0.5. If the system is released from rest and the block B moves a vertical distance 2m. What is the velocity of block B? Neglect the friction in pulley and the extension of the string. (8M)



7. In the figure, a block P of weight 50 N is pulled so that the extension in the spring is 10 cm. The stiffness of the spring is 4 N/cm and the coefficient of friction between the block and the plane O-x is μ=0.3. Find (i) the velocity of the block as the spring returns to its un-deformed state. (ii) the maximum compression in the spring. (16M)