Subject Code: R13210/R13

I B. Tech II Semester Supplementary Examinations April/May - 2017
ENGINEERING MECHANICS
(Com. to ECE, EEE, EIE, BOT, E Com E, AGE)

**Time: 3 hours**   **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

PART-A

1. a) Define (i) Angle of friction (ii) Cone of friction.   [4]
    b) Discuss the equilibrium equations for a body in space.   [3]
    c) State Pappu's theorems.   [3]
    d) State and explain perpendicular axis theorem.   [4]
    e) A particle moves in a circular path of 0.3 m radius. Calculate the acceleration if   [4]
        speed is 0.6 m/s but increasing at the rate of 0.9 m/s^2 each second.
    f) Discuss the advantages of work-energy theorem.   [4]

PART-B

2. a) Define: (i) coefficient of friction (ii) Moment of force.   [4]
    b) The block having a mass of 10kg is placed on an inclined plane is subjected to   [12]
        horizontal and vertical forces as shown in the figure. Find the algebraic sum of
        component of forces along x and y axis such that x-axis is parallel and y-axis is
        perpendicular to the inclined.
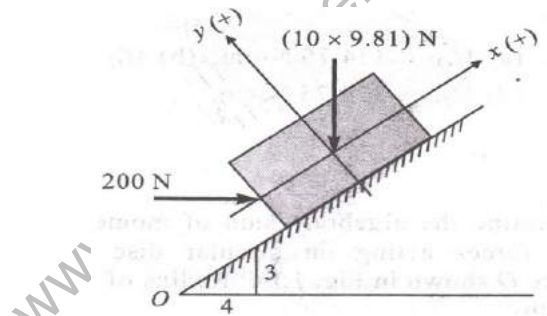

3. a) Explain coplanar concurrent force system.   [4]
    b) Find the horizontal distance to which a 1m long in extensible string holding   [12]
        weight of 500N can be pulled before the string breaks. The string can withstand
        the maximum pull of 1000N as shown in the figure. Determine also the required
   force F.
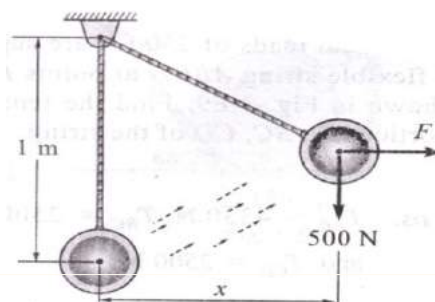
4. a) Determine an expression for the center of gravity of a right circular solid cone about is base from first principles. [8]

    b) Determine the centroid of the shaded portion given in the figure (All dimensions in mm). [8]
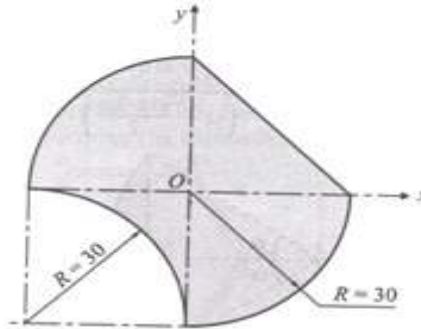
5. a) Determine the moment of inertia for a circle of radius r about the diameter. [8]

    b) Find the Moment of Inertia about the centroidal axis for the given figure (All dimensions are in mm). [8]
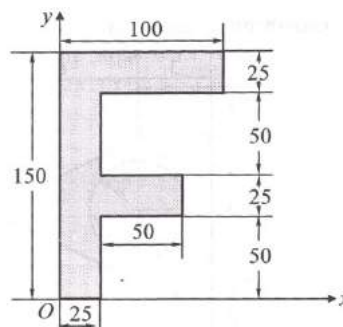
6. a) When the angular velocity of a 1.2 m dia pulley is 3 rad/s, the total acceleration of a point on its rim is 9 m/s^2. Determine the angular acceleration of the pulley at this instance. [6]

    b) A train is uniformly accelerated and passes successive kilometer stones with velocities of 18 kmph and 36 kmph 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. [10]

7. a) Discuss the energy of motion for a rigid body rotating about a fixed axis. [6]

    b) A spring is used to stop a 100 kg package which is moving down a 30^0 incline. The spring has a constant k=30 kN/m and is held by cables so that it is initially compressed 90 mm. If the velocity of the package is 5 m/s and it is 9 m from the spring, determine the maximum additional deformation of the spring in bringing the package to rest. Assume coefficient of friction as 0.2. [10]