THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

FACULTY OF ENGINEERING & TECHNOLOGY

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EME 4207 ENGINEERING MECHANICS-DYNAMICS

SUPPLEMENTARY EXAMINATIONS

YEAR II

SEMESTER II EXAMS

SERIES OCTOBER 2011

TIME 2HRS

INSTRUCTION TO CANDIDATES

You should have the following for this examination

- **Drawing instruments**
- **Scientific Calculator**

This paper consists of FIVE questions in, question ONE is compulsory,

Answer question ONE and any other TWO question ,

Maximum marks for each part of a question are as shown.

Question 1

a) Ball A is thrown upward from the top of a 30 m high building with an initial velocity of 5m/s. At the same instant another ball B is thrown upward from the ground with an initial velocity of 20 m/s. Determine the height from the ground at the time they pass each other.

(10 marks)

b) A projectile is fired with a speed of v=60m/s at an angle of 60º. A second projectile is then fired with the same speed 0.5 s later. Determine the angle θ of the second projectile so that the two projectiles collide. At what position (x, y) will this happen?

(10 marks)

c) Determine the acceleration of the system and the tension in each cable in figure 1. The inclined plane is smooth, and the coefficient of kinetic friction between the horizontal surface and block *C* is $(\mu k)_C = 0.2$.

(10 marks)

Question 2

Use the equations of linear motion to solve the following questions.

a) A car is travelling at 15 m/s, when the traffic light 50 m ahead turns yellow. Determine the required constant deceleration of the car and the time needed to stop the car at the light.

(10 marks)

b) A particle is moving along a straight line with the acceleration $a = (12t - 3t^{1/2})$ m/s², where *t* is in seconds. Determine the velocity and the position of the particle as a function of time. When t = 0, v = 0 and s = 15 m.

(10 marks)

Question 3

Use the equations of force and acceleration to answer the following questions.

In figure 2 the 800-kg car at *B* is connected to the 350-kg car at *A* by a spring coupling. Determine the stretch in the spring if (a) the wheels of both cars are free to roll and (b) the brakes are applied to all four wheels of car *B,* causing the wheels to skid. Take . Neglect the mass of the wheels. (μk)B = 0

(20 marks)

Question 4

The satellite in figure 3 is in an elliptical orbit having an eccentricity of e = 0.15. If its velocity at perigee is V_P = 15 Mm/h, determine using, the equations of force and acceleration, its velocity at apogee *A,* and the period of the satellite.

(20 marks)

Question 5

When the 2-kg bob in figure 4 is given a horizontal speed of 1.5 m/s, it begins to rotate around the horizontal circular path *A*. If the force **F** on the cord is increased, the bob rises and then rotates around the horizontal circular path *B*. Determine the speed of the bob around path *B*. Also, find the work done by force **F**.

(20 marks)

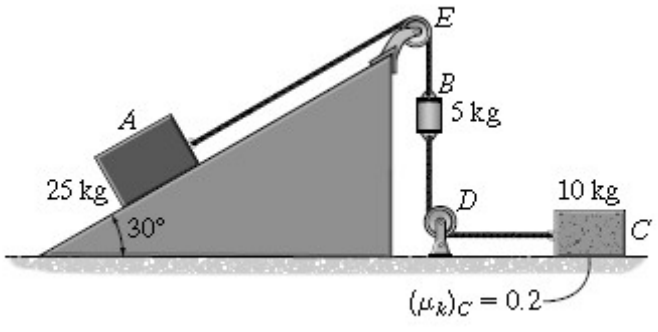

Figure 1

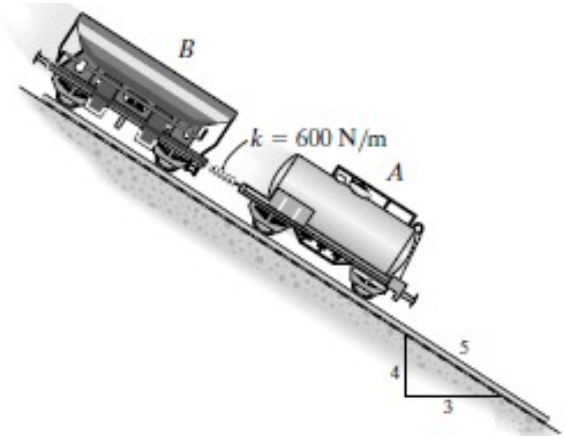

Figure 2

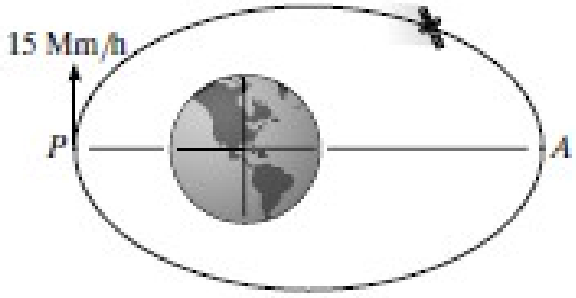

Figure 3

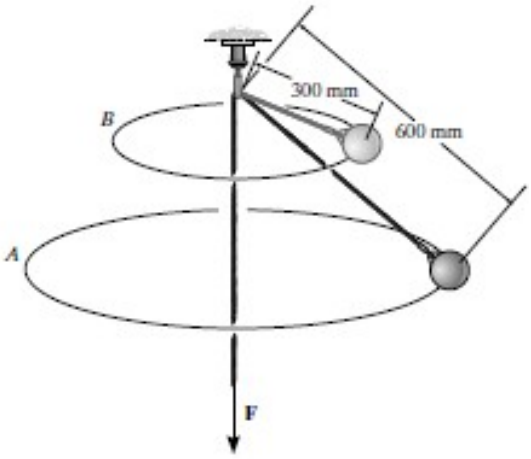

Figure 4