Sultan Qaboos University

Physics Department, College of Science
Physics 2107: Physics for Engineering I
Spring Semester 2007 – Final Examination

Monday 21st May 2007 **Time:8:00 – 11:00 am**

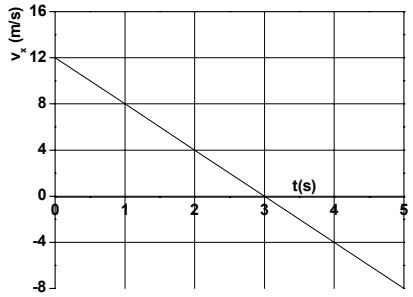
ID No.:	1	2	3	4	5	6	7	Total
Name:								

Full Mark:100 points	Please check that your examination paper has 7 **Questions** **Do not use additional papers. Do not write your section number**

1) The figure shows the velocity versus time graph. If a particle starts motion at t=0.0 from x_0 = 10.0 m:

a) Write the equation describing the position of the particle as a function of time t.
b) What are the positions of the particle at t= 2 s and t = 4 s.?
c) What is the position of the particle at the instant when it momentarily stops?
d) Find the distance and displacement of the particle between t = 2 s and t = 5 s.

(15 points)



2) A force **F**= -2i + 3k acts on a particle which is at rest (when t = 0 s) at point p with position vector **r** = 3i – 4j

a) Determine the torque in vector notation acting on the particle relative to the origin, at t=0.

b) Calculate the angular momentum in vector notation of the particle after t= 5 s, assuming constant torque.

(13 points)

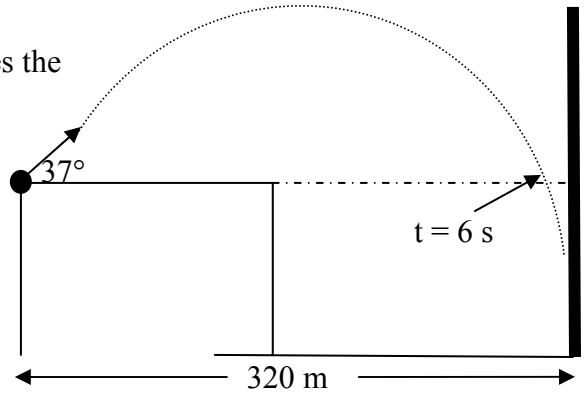
3) A ball is thrown with an initial velocity v_o at an angle of 37° with the horizontal at a wall. After six seconds the ball is observed to be at the same height traveling downwards as in the figure.

a) What is the initial velocity v_o of the ball? **(14 points)**

b) What is the maximum height above the initial throwing position, reached by the ball?

c) What is the final velocity of the ball in vector notation when it hits the wall 320.0 m away?

d) How far below the initial throwing position does the ball hit the wall?



4) A force $\mathbf{F} = (2x-1)i$ (where i is the unit vector along x-axis, F is in Newton and x is in meters) acts on 4.0 kg object.

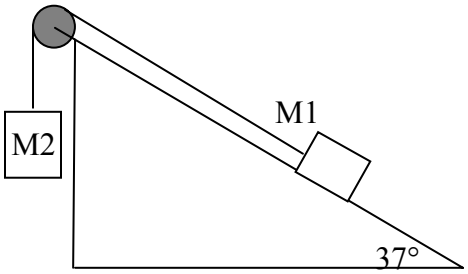
a) Find the work done by the force in moving the particle from the origin to the position x = 5.2 m

b) Find the final velocity (in vector notation) of the particle if the initial velocity was $\mathbf{v_o} = 5i + 10j$.

(13 points)

5) A 2.0 kg block M1 is on a 37° inclined plane with a coefficient of fraction of 0.25. It is tied to a second block M2 of mass 4.0 kg as shown in the figure. The rope goes over a pulley of mass 12.0 kg and radius of 10.0 cm ($I_{pully} = ½MR^2$). If the blocks are released

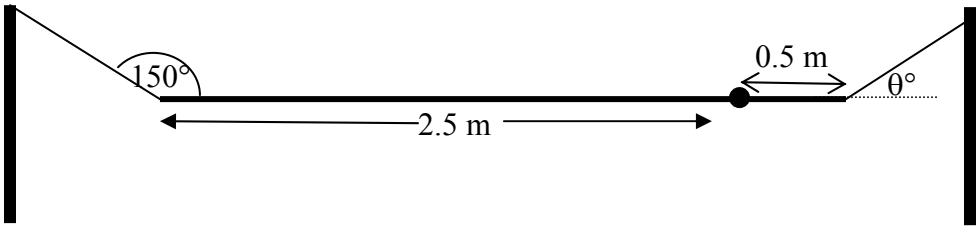
a) Find the acceleration (in magnitude and direction) of the blocks? (**15 points**)
b) The tensions in the rope.
c) The angular acceleration of the pulley.



6) A uniform rod 3.0 m long, weighing 240.0 N is held in a horizontal position by two ropes at its ends. As in the figure, the left rope makes an angle of 150° with the rod and the right rope makes an angle θ with the horizontal. A 90.0 N monkey hangs 0.50 m from the right end of the rod and keeping the rod horizontally stable.

a) Calculate the tensions (T_L and T_R) in the two ropes.

b) Calculate the angleθ. (**15 points**)



7) A horizontal spring-block system with m = 4.0 kg and k = 256 N/m is at rest on a frictionless surface. A 12.0 g bullet with a velocity of 420 m/s strikes the block at t = 0 s, and is embedded in it.

a) Find the amplitude of the resulting simple harmonic motion (SHM).
b) Write the displacement of the system as a function of time.
c) At which time after the bullet hits the block, does the block reach its maximum speed? Find this speed.
d) At which time is the magnitude of the acceleration of the block maximum? Find this acceleration.

(15 points)