NAME:_____ Lab section/Lab time:_____

MECH 2110 Exam 2

1. In dynamics, a particle is assumed to have _____.
   A) both translation and rotational motions; B) only a mass; C) a mass but the size and shape cannot be neglected; D) no mass or size or shape, it is just a point.

2. A particle is moving with an initial velocity of v=12 ft/s and constant acceleration of 3.78 ft/s^2 in the same direction as the velocity. Determine the distance the particle has traveled when the velocity reaches 30 ft/s.
   A) 50 ft; B) 100 ft; C) 150 ft; D) 200 ft.

3. From the experimental data, the motion of a jet plane while traveling along a runway is defined by the $v-t$ graph, as shown in Fig. 3.
   1. What is the the initial acceleration of the plane?
   A) 80 m/s^2; B) 400 m/s^2; C) 8 m/s^2; D) 10 m/s^2.
   2. What is the displacement of the plane in the first 40 seconds?
   A) 400 m; B) 2400 m; C) 2800 m; D) 3200 m.

4. If the position of a particle is defined by $\mathbf{r} = [(1.5t^2+1)\,\mathbf{\imath} + (4t-1)\,\mathbf{\jmath}]$ [m], its speed at t=1 s is
   A) 2 m/s; B) 3 m/s; C) 5 m/s; D) 7 m/s.

5. The path of a particle is defined by $y = 0.5x^2$, x and y are in [m]. If the component of its velocity along the x-axis at x=2 m is v_x=1 m/s, its velocity component along the y-axis at this position is
   A) 0.25 m/s; B) 0.5 m/s; C) 1 m/s; D) 2 m/s.

6. The block of weight W=10 lb has initial velocity v_0=10 ft/s on a smooth horizontal plane (Fig. 6). The gravitational acceleration is g=32.2 ft/s^2. If a time dependent force $F = b\,t = (2.5)\,t$ [lb] acts on the block from t_0=0 s until the final time t_f=3 s, the final velocity of the block is
   A) 46.23 ft/s; B) 35.33 ft/s; C) 20.07 ft/s; D) 30.22 ft/s.

7. The conveyor belt is moving at speed v=4 m/s (Fig. 7). The coefficient of static friction between the conveyor and the package of mass M=10 kg is μ_s=0.2. The gravitational acceleration is g=9.81 m/s^2. The shortest time the belt can stop so that the package does not slide on the belt is
   A) 1.05 s; B) 3.12 s; C) 5.09 s; D) 2.04 s.

8. The box of weight W=10 lb slides down the smooth curved ramp of equation $y = x^2/b = x^2/8$, x and y are in [ft] (Fig. 8). The box starts from rest at a height of h ft. The gravitational acceleration is g=32.2 ft/s^2. At the instant it reaches the point O the box has the speed v_O=5 ft/s.
   1. The height h is
   A) 0.188 ft; B) 0.288 ft; C) 0.388 ft; D) 0.488 ft.
   2. The normal force on the box at the end of the curved ramp (at O) is
   A) 18.383 lb; B) 15.478 lb; C) 14.741 lb; D) 11.941 lb.

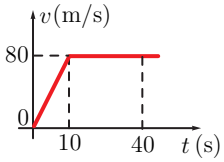

Figure 3: Problems 3

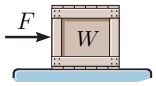

Figure 6: Problems 6

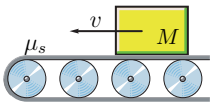

Figure 7: Problems 7

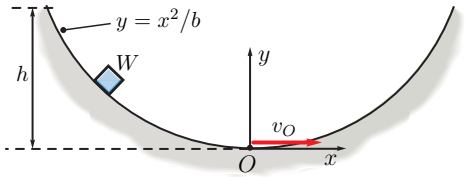

Figure 8: Problems 8