Assignment No. 4 (SECTION F and H)

1. Consider the two vectors $\mathbf{A} = 3\mathbf{i} - 2\mathbf{j}$ and $\mathbf{B} = -\mathbf{i} - 4\mathbf{j}$. Calculate (a) $\mathbf{A} + \mathbf{B}$, (b) $\mathbf{A} - \mathbf{B}$, (c) $|\mathbf{A} + \mathbf{B}|$, (d) $|\mathbf{A} - \mathbf{B}|$ and (e) the directions of $\mathbf{A} + \mathbf{B}$ and $\mathbf{A} - \mathbf{B}$.

2. Vector **A** has a negative *x* component 3.00 units in length and a positive *y* component 2.00 units in length. (a)Determine an expression for **A** in unit–vector notation. (b) Determine the magnitude and direction of **A**. (c) What vector **B** when added to **A** gives a resultant vector with no *x* component and a negative *y* component 4.00 units in length?

3.Determine the value of "a" so that $\vec{A} = 2i + aj + k$ and $\vec{B} = 4i - 2j - 2k$ are perpendicular. (06)

4. The position of a particle moving in an XY direction is given by $\mathbf{r} = [\ 2t^3 - 5t\ ]\ \mathbf{i} + [\ 6 - 7t^4\ ]\ \mathbf{j}$ where "x" is in meter and "t" is in second. Find an expression for the velocity and acceleration as a function of time.

5. When two objects having masses **M=3m** and **m** are hung vertically over a frictionless pulley of negligible mass, determine the magnitude of the acceleration of the two objects and the tension in the lightweight cord.

6. You have most likely had the experience of standing in an elevator that accelerates upward as it moves toward a higher floor. In this case, you feel heavier. Are you heavier, or there is something apparently increased? Explain your answer.

7. Find the angle of the projectile if the maximum height and range of the projectile are equal.

8. You press your physics textbook flat against a vertical wall with your hand. What is the direction of the friction force exerted by the wall on the book? Explain your answer.

8. In Fig. 1 let the mass of the block be 8.5 kg and the angle θ be 30°.Find (a) the tension in the cord and (b) the normal force acting on the block. (c) If the cord is cut, find the magnitude of the resulting acceleration of the block.

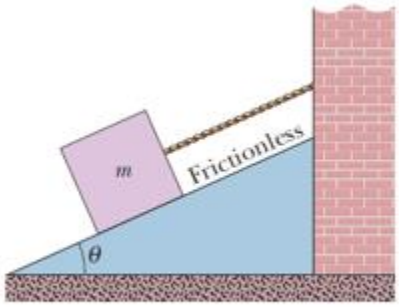

Fig 1

9. When a car stops suddenly, the passengers tend to move forward relative to their seats. Why?

10. Which of the following will and will not make an example of inertial observer? Give reasons of each parts. (i) A swinging pendulum (iii) Earth's motion about sun (iv) Horizontal component of projectile motion.

11. Can a scalar quantity be a negative quantity? Give example

12. A golf ball is released from rest from the top of a very tall building. Neglecting air resistance, calculate (a) the position and (b) the velocity of the ball after 1.00, 2.00, and 3.00 s.

13. A 0.150kg particle moves along an x-axis according to $x(t)= -13.00 + 2.00t + 4.00t^2 – 3.00t^3$ with x in meters and t in seconds. In unit vector notation, what is the net force acting on the particle at t= 3.40 sec?