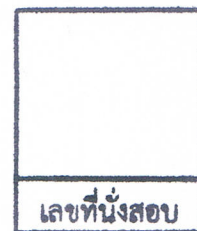# College of Industrial Technology

King Mongkut's University of Technology North Bangkok

Final Examination of Semester 1

Subject: 392131 Physics I

Date: 28 September 2013

Year: 2013

**Section:** 15 - 16

Time: 10.00 – 12.00

Name:_____ ID:_____Class:_____

Instructions:

1. Cheating will result in failure of all classes registered for the current semester. Students who are caught cheating will also be denied registering for the following semester.

2. No documents are allowed to be taken inside the examination room.

3. Textbooks are **NOT** allowed.

4. Express your answer in English. Other languages will be discarded.

5. A scientific calculator is allowed.

6. Electronic communication devices are **NOT** allowed in the examination room.

7. The examination has 7 pages (including this page), 14 questions and a total score of 60 points.

8. Write all your answers on this exam sheet.

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1. The two forces $\vec{F_1}$ and $\vec{F_2}$ act on a 27.0 kg object on a frictionless tabletop. If F_1 = 10.2 N and F_2 = 16.0 N. Find (4 points)
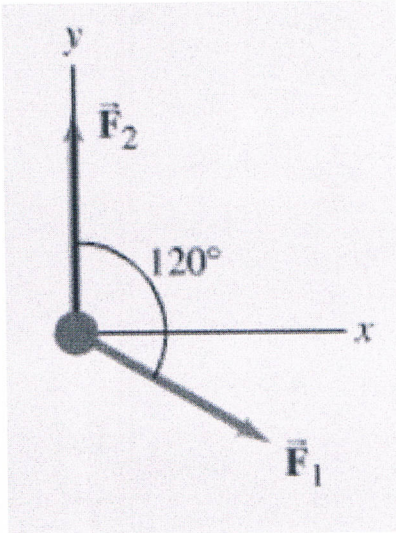
    a) the net force on the object.

    b) its acceleration.

2. If Earth's mass and radius both suddenly doubled, what would be the new value of the acceleration of gravity near Earth's surface? (2 points)

3. What is the weight of a 76 kg astronaut (3 points)

    a) on Earth?

    b) on the moon? (g = 1.7 m/s^2)

    c) in outer space traveling with constant velocity?

4. A horizontal force of 95.0 N is applied to a 50.0 kg crate on a rough, level surface. If the crate accelerates at 1.40 m/s^2, what is the magnitude of the force of kinetic friction acting on the crate? (2 points)

5. What average force is required to stop an 1100 kg car in 8.0 s if the car is traveling at 95 km/h? (4 points)

6. A 75 kg man standing on a scale in an elevator notes that as the elevator rises, the scale reads 900 N. What is the acceleration of the elevator? (3 points)

7. How much tension must a rope withstand if it is used to accelerate a 1,200 kg car vertically upward at 0.80 m/s^2 ? (3 points)

8. A boat moves through the water with two forces acting on it. One is a 2,500-N forward push by the water on the propeller, and the other is a 1,600 N resistive force due to the water around the bow. (5 points)

(a) What is the acceleration of the 1,000 kg boat?

(b) If it starts from rest, how far will the boat move in 10.0 s?

(c) What will its velocity be at the end of that time?

9. Two blocks of mass 3.50 kg and 8.00 kg are connected by a massless string that passes over frictionless pulley. The inclines are frictionless. Find (7 points)
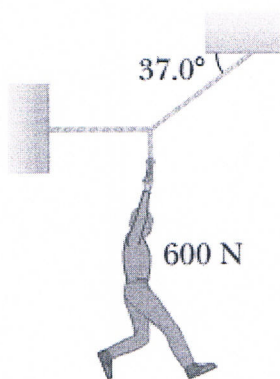
a) the magnitude of the acceleration of each block.

b) the tension in the string.

3.50 kg

8.00 kg

35.0°   35.0°
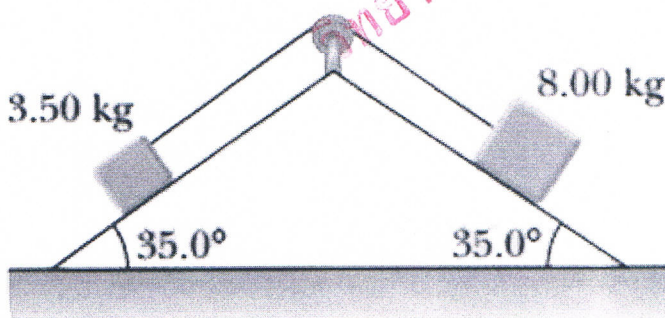
10. Arlene is to walk across a "high wire" strung horizontally between two buildings 10.0 m apart. The sag in the rope when she is at the midpoint is 10.0^0. If her mass is 50.0 kg, what is the tension in the rope at this point? (5 points)


10.0°

11. (a) Find the tension in each cable supporting the 600 N cat burglar

   (b) Suppose the horizontal cable were reattached higher up on the wall. Would the tension in the other cable increase, decrease, or stay the same? Why? (4 points)

37.0°

600 N

12. Two crates of mass 75 kg and 110 kg are in contact and rest on a horizontal surface. A 620 N force is exerted on the 75 kg crate. If the coefficient of kinetic friction is 0.15, calculate (5 points)

    a) the acceleration of the system.

    b) the force that each crate exerts on the other.
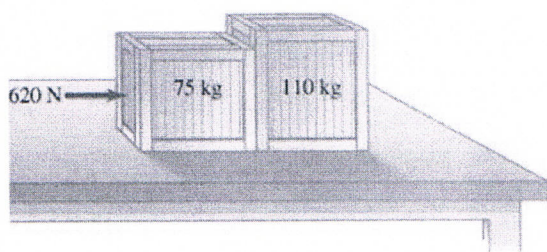
13. a) Suppose the coefficient of kinetic friction between m_1 and the plane is $\mu_k=0.15$, and that $m_1 = m_2$ = 2.7 kg. As m_2 move down, determine the magnitude of the acceleration of m_1 and m_2, given $\theta=25^0$

    b) What smallest value of μ_k will keep this system from accelerating? (7 points)
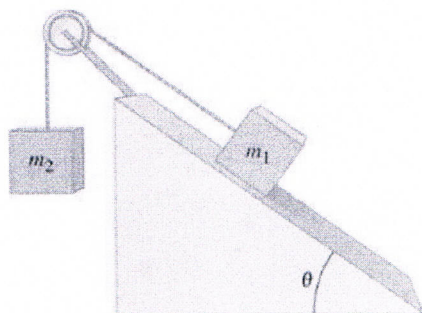
14. A block of mass 3.00 kg is pushed against a wall by a force **P** that makes a $\theta = 50.0^0$ angle with the horizontal. The coefficient of static friction between the block and the wall is 0.25. Determine the possible values for the magnitude of P that allow the block to remain stationary. **(6 points)**

50.0°

P
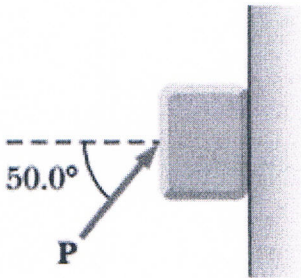
Good Luck

Dr. Prakasit Changsuphan