

Sultan Qaboos University
Department of Physics, College of Science
PHYS2107: Physics for Engineering I - Test 2

Name:
ID No:

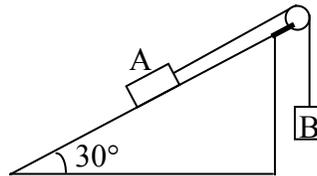
1	2	3	4	Tot.

Full Mark: 40 points	Answer all questions
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Monday, 17th April 2006

Time: 5:15 – 6:45 pm

1. Two blocks A and B are connected with a cord over a massless pulley, as shown in the figure. The mass of block A, on the 30°-inclined plane, is 25 kg and the coefficient of kinetic friction and static friction are $\mu_k = 0.15$ and $\mu_s = 0.4$, respectively.



- a) Find the minimum mass of block B so that the block A is about to slide down the inclined plane.
- b) Find the maximum mass of block B so that the block A is about to slide up the inclined plane.
- c) What is the mass of block B and the tension in the cord when the block A is accelerated up the inclined plane with 1.5 m/s^2 .

(mark: 3+3+4)

2. A 1.5 kg block, initially at rest at the origin ($x_0 = 0$ and $y_0 = 0$), is subjected to a unique force $\mathbf{F} = 2\mathbf{i} + 5y\mathbf{j}$ (*entries are in Newton*).

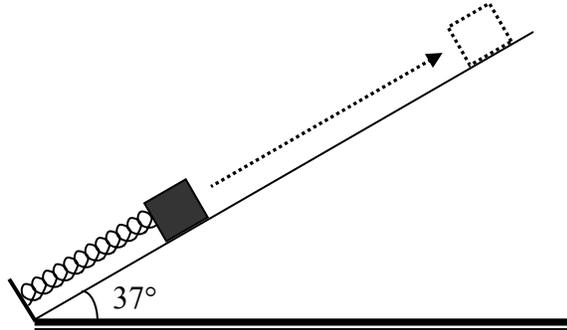
a) What work is done by the force \mathbf{F} as the block moves from a position $\mathbf{r}_1 = 1.5\mathbf{i} + 2\mathbf{j}$ to $\mathbf{r}_2 = -2\mathbf{i} + 4\mathbf{j}$ (with the entries in meters)?

b) Is the block accelerated or decelerated between positions \mathbf{r}_1 and \mathbf{r}_2 ? Justify your answer.

c) What is the speed of the block at $\mathbf{r}_1 = 1.5\mathbf{i} + 2\mathbf{j}$?

(mark: 4+2+4)

3. A 1.5 kg block is pushed against a spring (block is not attached to the spring) on 37° -inclined plane, until the spring is compressed 35 cm and released from rest. The coefficient of kinetic friction between the block and the inclined plane is $\mu_k = 0.35$; and the spring constant is 150 N/m.



- a) What is the change in gravitational potential energy of the block when it momentarily stops?
- b) What is the corresponding increase ΔE_{th} in the thermal energy of the block-floor system?

(mark: 6 + 4)

4. Two particles, of masses $m_1 = 1.5 \text{ kg}$ and $m_2 = 2 \text{ kg}$, slide initially across a frictionless horizontal plane with velocities $\mathbf{v}_1 = 2\mathbf{i} - 5\mathbf{j}$ and $\mathbf{v}_2 = -4\mathbf{i} + 10\mathbf{j}$, respectively. They collide and stick together.

- a) What is the velocity (magnitude and direction) of the center of mass before and after the collision?
- b) What is the impulse on the particle m_1 due to collision?
- c) What is the change in kinetic energy of the system?

(mark: 4+3+3)