Seat No.

College of Industrial Technology
King Mongkut's University of Technology North Bangkok

Final Examination of Semester 1 Year: 2020
Subject: 392131 Physics I Section: 15-18
Date: 29 October 2020 Time: 08.00-10.00

Name:_____ ID:_____ Class:_____

Directions: The test is designed to measure your comprehension. The test is divided into 1 section. There will be 6 pages (including this page) and they are worth 50 points.

- This exam paper contains no errors. If a suspected error is found, it is the student's discretion to correct it.
- Answer the questions on this test paper.
- Books, documents and lecture notes are not allowed.
- You must be in the room for one hour after the exam is started and, while taking the exam, you cannot go out except in an emergency case.
- Before leaving, make sure you do not bring this test outside.
- Do not use any electronic communication device.
- Calculators cannot be used in this test.
- Give g = 10 m/s^2 and Gravitational constant (G) = 6.6×10^{-11} Nm^2/kg^2

Now begin the test.

Cheating in the exam is considered an extremely serious offence which will result in expulsion from the University.

1. What is the net force required to give an automobile of mass 1600 kg an acceleration of 4.5 m/s^2? (3 Points)

2. A bicycle takes 8.0 seconds to accelerate at a constant rate from rest to a speed of 4.0 m/s. If the mass of the bicycle and rider together is 85 kg, what is the net force acting on the bicycle? (3 Points)

3. For each of the following interactions, identify action and reaction forces (action-reaction pairs): (3 Points)

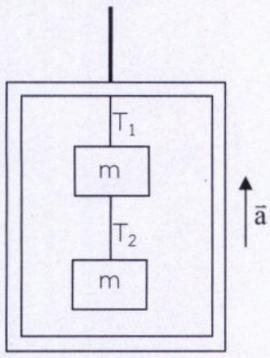
	Action Force	Reaction Force
a. A hammer hits a nail		
b. Earth's gravity pulls down on you		
c. A helicopter blade pushes air downward		
d. You step off a curb		
e. You pat your friend on the back		
f. A wave hits a rocky shore		
a. A hammer hits a nail		

4. Jane has a mass of 40 kg. She pushes on a 50 kg rock with a force of 100 N. What force does the rock exert on Jane, when

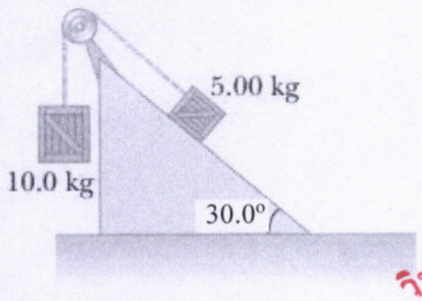
(a) Jane and rock rest (2 Points)

(b) rock move in acceleration 2 m/s^2 (2 Points)

5. Two blocks each of mass m 50 kg are fastened to the top of an elevator as in Figure.
(a) If the elevator has an upward acceleration a 5 m/s^2, find the tensions T_1 and T_2 in the upper and lower strings. (3 Points)
(b) If the strings can withstand a maximum tension of 85.0 N, what maximum acceleration can the elevator have before the upper string breaks? (3 Points)

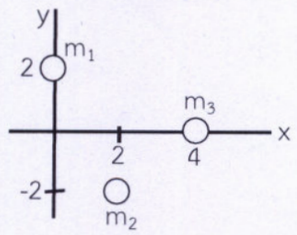


6. Two packing crates of masses 10.0 kg and 5.00 kg are connected by a light string that passes over a frictionless pulley as in Figure below. The 5.00 kg crate lies on a smooth incline of angle 30.0°. Find

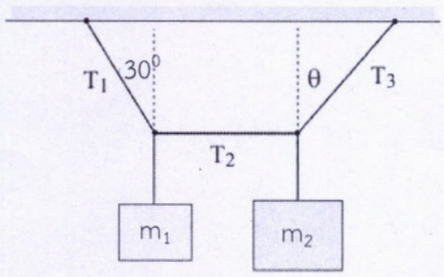


a) tension force (2 Points)
b) acceleration of mass 10 kg (1 Points)
c) if μ_s = 0.2 and μ_k = 0.1 between mass 5 kg and incline plane. What is acceleration of mass 10 kg ? (give $\sqrt{3} = 1.7$) (2 Points)

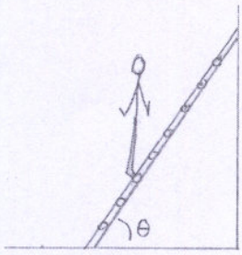
7. If the mass of m_1 is 1 kg, m_2 is 2 kg and m_3 is 3 kg in the figure, what is the coordinate of the center of mass? (2 Points)



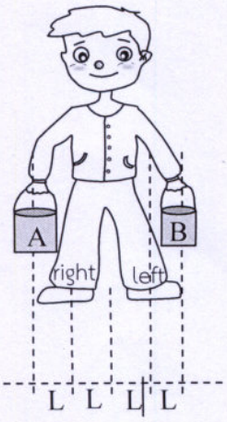
8. The system in Figure is in equilibrium with the string in the center exactly horizontal. By m_1 is $4\sqrt{3}$ kg and m_2 is 4 kg. Find (a) tension T_1, (b) tension T_2, (c) tension T_3 and (d) angle θ. (6 Points)



9. A person of mass m_p is standing on a rung, one third of the way up a ladder of length d. The mass of the ladder is m_l, uniformly distributed. The ladder is initially inclined at an angle θ with respect to the horizontal. Assume that there is no friction between the ladder and the wall but that there is friction between the base of the ladder and the floor with a coefficient of static friction μ_s. In this problem you will try to find the minimum coefficient of friction between the ladder and the floor so that the person and ladder do not slip. (6 Points)



10. A man mass M carries two full buckets of water as shown in the figure, with bucket "A" twice the volume of bucket "B". If the bucket "B" has volume V. How many times will this man's right leg carry more weight than the left leg? (Give density of water is ρ ,The empty bucket "A" and empty bucket "B" are massless) (6 Points)



11. The gravitational force between objects A and B is 4 N. If the mass of B were one-half as large as it currently is while A's mass remains the same, how large is the gravitational force? (3 Points)

12. What is the value of the acceleration due to gravity, g on the Moon if its mass is 8×10^{22} kg and its radius is 1,800 km? (Gravitational constant = 6.6×10^{-11} Nm^2kg^2)
(3 Points)

This Final Examination by
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