**INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC**

**FINAL EXAMINATION – CLASS**

**Student Name:**_____ **Student ID:**_____

Date: AUGUST 2018

Duration: 90 minutes

| **SUBJECT: PHYSICS 1** | |
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| Head of Department of Physics:<br>Signature:<br><br>Full name: Phan Bao Ngoc | Lecturers: Phan Bao Ngoc, Do Xuan Hoi,<br>Dao Ngoc Hanh Tam<br>Signature:<br><br>Full name: |

**INSTRUCTIONS: This is a closed book examination. Use of cell phones, laptops and dictionaries is not allowed.**

**Question 1 (20 pts)** A 0.4-kg ball is initially moving horizontally to the left at 20 m/s. A boy suddenly kicks the ball away with a velocity at 45° upward, magnitude 30 m/s and to the right. Find the magnitude and direction of the average force acting on the ball if the collision time is 0.01 s.

**Question 2 (20 pts)** A crate of mass 10.0 kg is pulled by a force up a rough incline with angle 20.0° to the horizontal. The initial speed of the crate is 1.50 m/s. The pulling force is 100 N parallel to the incline. What is the speed of the crate after being pulled 5.0 m? The coefficient of friction is 0.4.

**Question 3 (20 pts)** An external torque of 5.0 N.m is applied to a bicycle wheel for 2.00 s, the angular speed of the wheel increases from 0 to 100 revolutions/min.

(a) Compute the moment of inertia of the wheel.

(b) The external torque is then removed, and the wheel is brought to rest by braking in 125 s. Compute the torque of the friction due to the braking and the total number of revolutions made by the wheel in this time interval.

**Question 4 (20 pts)** A helicopter has four blades, each is $L = 4.00$ m long and $M = 5.00$ kg in mass. The moment of inertia of each blade (essentially a thin rod) is $I = \frac{ML^2}{3}$. The helicopter has a mass of 1000 kg.

(a) Calculate the rotational kinetic energy of four blades when they rotate at 300 revolutions/min.

(b) To what height could the helicopter be raised if all the rotational kinetic energy is used to lift it?

**Question 5 (20 pts)** A skater is spinning at 32.0 rad/s with her arms and legs extended outward. In this position, her moment of inertia is 45.6 kg.m$^2$. If she pulls her arms and legs in close to her body, her moment of inertia is 17.5 kg.m$^2$:

(a) What is her new angular velocity?

(b) By what factor does her rotational kinetic energy change and where does her extra rotational kinetic energy come from?

**THE END**