

## PHY 211 – Exam 2 (Version 1)

Name (please print): \_\_\_\_\_

SUID: \_\_\_\_\_

Please circle your TA's name:    ~~Tyler~~    ~~Xingbo~~    ~~Zek~~

**It is very important that you print your name at the top of the exam page. Please do it before you read any questions!**

*Document your work. Use the back of each sheet if you run out of space.*

**1. [25 pts total]** A merry-go-round of radius 2 m is rotating counter-clockwise at 10 rpm. A child is sitting on the outer edge of the merry-go-round. The merry-go-round is given a push giving it an angular acceleration of  $0.4 \text{ rad/s}^2$ . Right at the instant when the angular acceleration begins, calculate the following:



- a. [3 pts] What is the speed of the child?
  
  
  
  
  
  
  
  
  
  
- b. [3 pts] What is the angular velocity of the child in rad/s?
  
  
  
  
  
  
  
  
  
  
- c. [4 pts] What is the radial (centripetal) acceleration of the child?

d. [10 pts] What is the total acceleration of the child, including the direction? Assume that the child is sitting at "3 o' clock" (as shown in the diagram) at the instant that the angular acceleration begins.

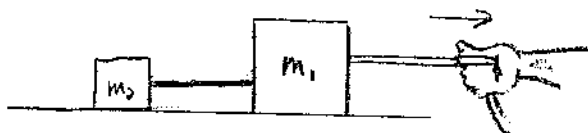
e. [5 pts] What is the speed of the child 5 seconds after the angular acceleration begins?



Name (please print): \_\_\_\_\_

SUID: \_\_\_\_\_

**3. [25 pts total]** The following diagram shows two wooden blocks attached by a string being pulled by another string along a wooden table. The masses of the blocks are  $m_1=0.22$  kg and  $m_2=0.15$  kg. The person pulling the string is pulling horizontally and exerting a force of 3 N. Friction is not negligible. The coefficient of static friction of wood on wood is 0.50 and the coefficient of kinetic friction of wood-on-wood is 0.20.



- [4pts] Draw the free body diagram for block one and the free body diagram for block two.
- [8pts] What is the maximum force that can be exerted before the blocks begin to accelerate?
- [8pts] Is the 3 N force pulling the string attached to the first block enough to accelerate the blocks? Explain. If the blocks are accelerating, what is the value of the acceleration?
- [5pts] What is the tension in the string connecting the blocks?

Name (please print): \_\_\_\_\_

SUID: \_\_\_\_\_

**4. [25 pts total]** A 65 kg passenger is standing on a scale in an elevator. The elevator undergoes constant acceleration to reach its cruising speed of 9 m/s, and it takes 4 seconds to reach its cruising speed starting from rest.

- a. [6 pts] What is the acceleration of the elevator?
  
  
  
  
  
  
  
  
  
  
- b. [4 pts] What is the weight (in Newtons) that the scale reads when the elevator is at rest?
  
  
  
  
  
  
  
  
  
  
- c. [5 pts] What weight does the scale read when the elevator is speeding up?
  
  
  
  
  
  
  
  
  
  
- d. [5 pts] What weight does the scale read when the elevator reaches cruising speed?
  
  
  
  
  
  
  
  
  
  
- e. [5 pts] Suppose the elevator cable snaps and the breaks give out, so that the elevator is in free fall. What is the weight that the scale reads then?