

## Phys 10154 - Fall 2006 - Exam #7B

Be sure to answer with the proper units and significant figures. Indicate your answers clearly with boxes. SHOW ALL WORK. Even if your answer is correct, I will deduct points if I can't see how you solved the problem. Both problems are worth 50 points.

1. A small flat block rests on the surface of a merry-go-round, right at edge, 1.5 meters from the center of rotation. The merry-go-round starts into motion, accelerating at an angular rate of  $0.25 \text{ rad/sec}^2$ . After 3.0 seconds have elapsed, find:

- a) The angular velocity
- b) The linear distance covered by the block
- c) The centripetal acceleration of the block (magnitude only)
- d) The total acceleration (magnitude and direction)

2. The space shuttle is in orbit around the Earth at an altitude of 850 miles above the surface. From there, it releases a 650-kg satellite that will go into a geosynchronous orbit (period of 23 hours and 56 min).

- a) What is the orbital speed of the shuttle, in meters/sec?
- b) What will be the final orbital speed of the satellite when it reaches geosynchronous orbit?
- c) How much work will gravity do on the satellite as it climbs from 850 miles to its final orbital position?

The Mass of Earth is  $5.98 \times 10^{24}$  kg

The Radius of Earth is  $6.38 \times 10^6$  m

The Gravitational Constant is  $6.67 \times 10^{-11}$  N-m<sup>2</sup>/kg<sup>2</sup>