Long Exam 2 – **Rotational Motion**

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

- 2 points for each correct answer
- –1 point for each incorrect answer
- 0 point for a blank item (no answer)
- maximum score: 36/30
- minimum score: –18

Long Exam 2 – **Rotational Motion**

1. The angular speed of the minute hand of a watch is:
   a. (60/π) rad/s
   b. 2π rad/s
   c. π rad/s
   d. (π/30) rad/s
   e. (π/60) rad/s

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

2. The angular velocity vector of a spinning body points out of the page. If the angular acceleration vector points into the page then:

a. the body is slowing down
b. the body is speeding up
c. the body is starting to turn in the opposite direction
d. the axis of rotation is changing orientation
e. none of the above

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

3. For a wheel spinning on an axis through its center, the ratio of the radial acceleration of a point on the rim to the radial acceleration of a point halfway between the center and the rim is:

a. 1 b. 2 c. ½ d. 4 e. ¼

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

4. A wheel initially has an angular velocity of 18 rad/s but it is slowing at a rate of 2.0 rad/s^2. By the time it stops it will have turned through:

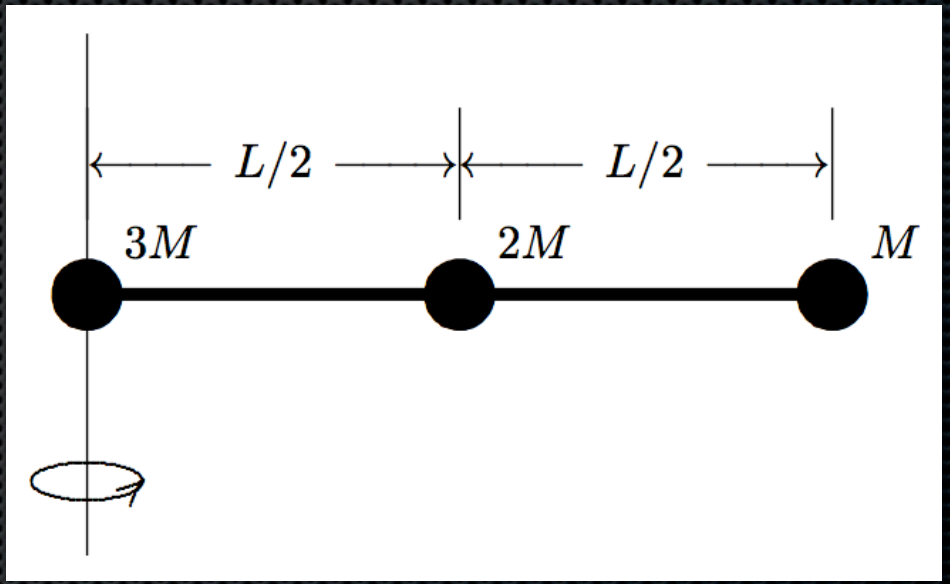
a. 81 rad b. 160 rad c. 245 rad d. 330 rad e. 410 rad

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

5. Three identical balls, with masses of M, $2M$, and $3M$, are fastened to a massless rod of length L as shown. The rotational inertia about the left end of the rod is:

a. $ML^2/2$
b. ML^2
c. $3ML^2/2$
d. $6ML^2$
e. $3ML^2/4$



1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

6. The rotational inertia of a disk about its axis is 0.70 kg·m^2. When a 2.0-kg weight is added to its rim, 0.40 m from the axis, the rotational inertia becomes:

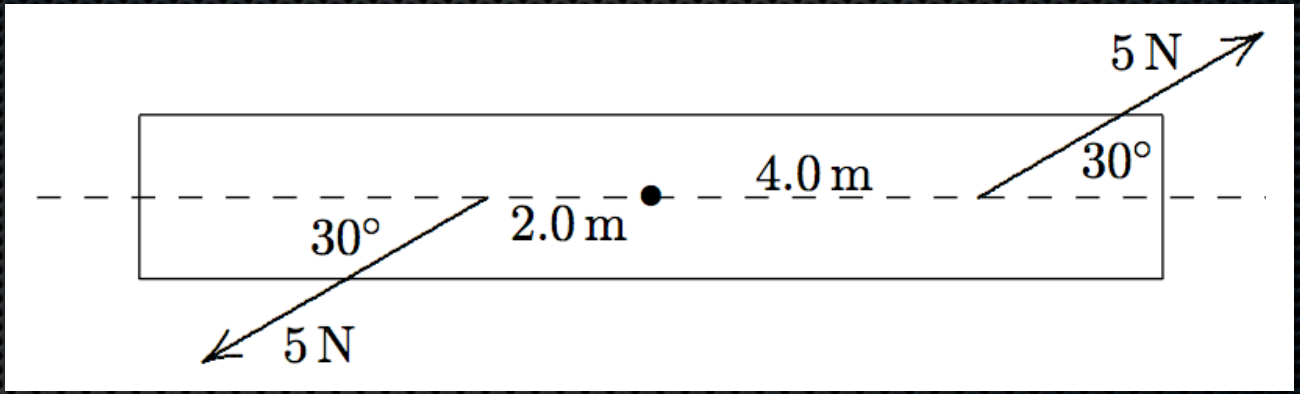
a. 0.38 *kg·m*^{2}
b. 0.54 *kg·m*^{2}
c. 0.70 *kg·m*^{2}
d. 0.86 *kg·m*^{2}
e. 1.0 *kg·m*^{2}

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

7. A rod is pivoted about its center. A 5-N force is applied 4 m from the pivot and another 5-N force is applied 2 m from the pivot, as shown. The magnitude of the total torque about the pivot (in N·m) is:

a. 0
b. 5
c. 8.7
d. 15
e. 26



1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

8. A disk is free to rotate on a fixed axis. A force of given magnitude *F*, in the plane of the disk, is to be applied. Of the following alternatives the greatest angular acceleration is obtained if the force is:

a. applied tangentially halfway between the axis and the rim
b. applied tangentially at the rim
c. applied radially halfway between the axis and the rim
d. applied radially at the rim
e. applied at the rim but neither radially nor tangentially

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

9. A cylinder is 0.10 m in radius and 0.20 m in length. Its rotational inertia, about the cylinder axis on which it is mounted, is 0.020 kg·m^2. A string is wound around the cylinder and pulled with a force of 1.0 N. The angular acceleration of the cylinder is:

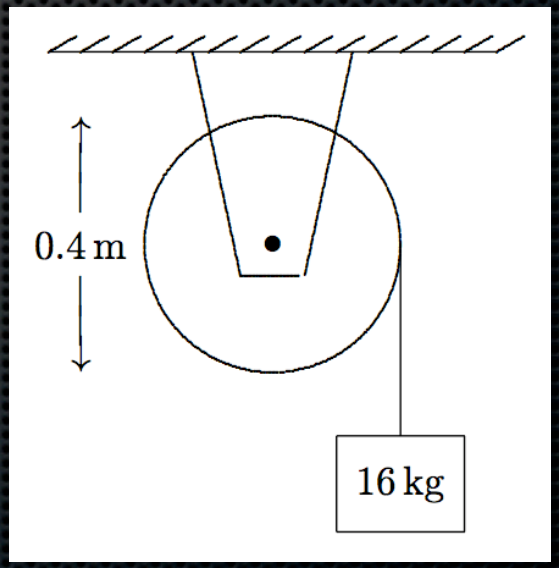
   a. 2.5 rad/s^2
   b. 5.0 rad/s^2
   c. 10 rad/s^2
   d. 15 rad/s^2
   e. 20 rad/s^2

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

10. A 16-kg block is attached to a cord that is wrapped around the rim of a flywheel of diameter 0.40 m and hangs vertically, as shown. The rotational inertia of the flywheel is 0.50 kg·m^2. When the block is released and the cord unwinds, the acceleration of the block is:

a. 0.15*g*
b. 0.56*g*
c. 0.84*g*
d. *g*
e. 1.3*g*



1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

11. A block is attached to each end of a rope that passes over a pulley suspended from the ceiling. The blocks do not have the same mass. If the rope does not slip on the pulley, then at any instant after the blocks start moving, the rope:

a. pulls on both blocks, but exerts a greater force on the heavier block
b. pulls on both blocks, but exerts a greater force on the lighter block
c. pulls on both blocks and exerts the same magnitude force on both
d. does not pull on either block
e. pulls only on the lighter block

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

12. A pulley with a radius of 3.0 cm and a rotational inertia of 4.5×10^{-3} kg·m^2 is suspended from the ceiling. A rope passes over it with a 2.0-kg block attached to one end and a 4.0-kg block attached to the other. The rope does not slip on the pulley. At any instant after the blocks start moving, the object with the greatest kinetic energy is:

a. the heavier block
b. the lighter block
c. the pulley
d. either block (the two blocks have the same kinetic energy)
e. none (all three objects have the same kinetic energy)

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

13. A pulley with a radius of 3.0 cm and a rotational inertia of 4.5×10^{-3} kg·m^2 is suspended from the ceiling. A rope passes over it with a 2.0-kg block attached to one end and a 4.0-kg block attached to the other. The rope does not slip on the pulley. When the speed of the heavier block is 2.0 m/s the kinetic energy of the pulley is:

a. 0.15 J b. 0.30 J c. 1.0 J d. 10 J e. 20 J

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

14. The angular momentum vector of Earth about its rotation axis, due to its daily rotation, is directed:

a. tangent to the equator toward the east
b. tangent to the equator toward the west
c. north
d. south
e. toward the Sun

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

15. A man, holding a weight in each hand, stands at the center of a horizontal frictionless rotating turntable. The effect of the weights is to double the rotational inertia of the system. As he is rotating, the man opens his hands and drops the two weights. They fall outside the turntable. Then:

a. his angular velocity doubles
b. his angular velocity remains about the same
c. his angular velocity is halved
d. the direction of his angular momentum vector changes
e. his rotational kinetic energy increases

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

16. A uniform sphere of radius *R* rotates about a diameter with an angular momentum of magnitude *L*. Under the action of internal forces the sphere collapses to a uniform sphere of radius *R*/2. The magnitude of its new angular momentum is:

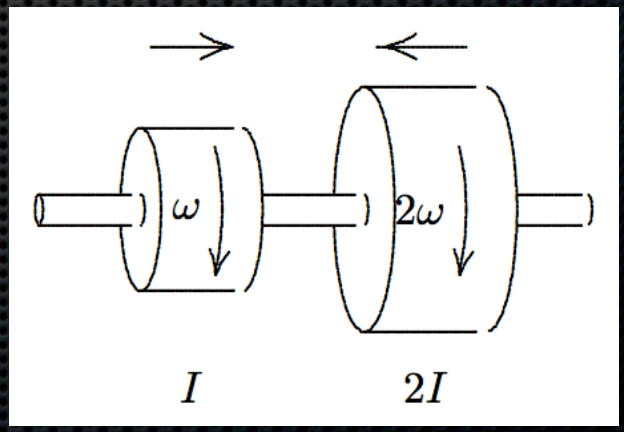
a. *L*/4 b. *L*/2 c. *L* d. 2*L* e. 4*L*

1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

17. Two disks are mounted on low-friction bearings on a common shaft. The first disc has rotational inertia *I* and is spinning with angular velocity ω. The second disc has rotational inertia 2*I* and is spinning in the same direction as the first disc with angular velocity 2ω as shown. The two disks are slowly forced toward each other along the shaft until they couple and have a final common angular velocity of:

a. 5ω/3
b. ω√3
c. ω √7/3
d. ω
e. 3ω

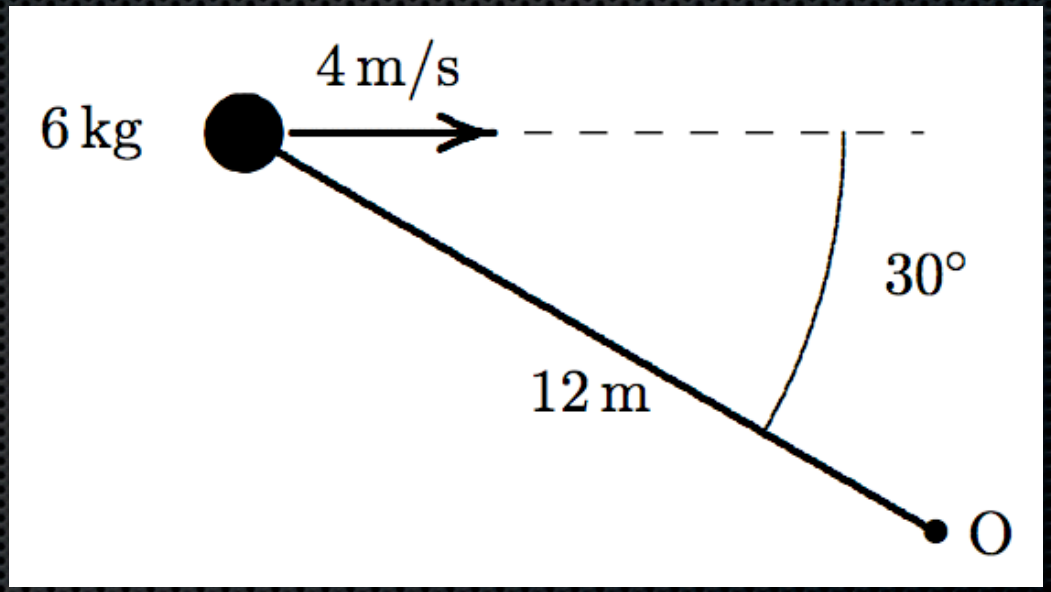


1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C

Long Exam 2 – **Rotational Motion**

18. A 6.0-kg particle moves to the right at 4.0 m/s as shown. The magnitude of its angular momentum about the point O is:

a. zero
b. 288 kg·m^2/s
c. 144 kg·m^2/s
d. 24 kg·m^2/s
e. 249 kg·m^2/s



1. D (bonus)	4. A	7. D	10. B	13. D	16. C
2. A	5. C	8. B	11. A	14. C	17. A
3. B	6. E	9. B	12. C	15. B	18. C