

This print-out should have 11 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

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### Changing Angular Speed

**001** (part 1 of 3) 10.0 points

As a result of friction, the angular speed of a wheel changes with time according to

$$\frac{d\theta}{dt} = \omega_0 e^{-\sigma t},$$

where  $\omega_0$  and  $\sigma$  are constants. The angular speed changes from an initial angular speed of 3.64 rad/s to 2.64 rad/s in 3.92 s.

Determine the magnitude of the angular acceleration after 3.44 s.

Correct answer: 0.224999 rad/s<sup>2</sup>.

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**002** (part 2 of 3) 10.0 points

How many revolutions does the wheel make after 3.03 s?

Correct answer: 1.55441 rev.

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**003** (part 3 of 3) 10.0 points

Find the number of revolutions it makes before coming to rest.

Correct answer: 7.0701 rev.

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### Serway CP 07 17

**004** (part 1 of 4) 10.0 points

A bug is on the rim of a disk of diameter 14 in that moves from rest to an angular speed of 75 rev/min in 6.4 s.

What is the tangential acceleration?

Correct answer: 0.218193 m/s<sup>2</sup>.

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**005** (part 2 of 4) 10.0 points

What is the tangential velocity of the bug at the end of the 6.4 s?

Correct answer: 1.39644 m/s.

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**006** (part 3 of 4) 10.0 points

One second after the bug starts from rest, what is its total acceleration?

Correct answer: 0.345407 m/s<sup>2</sup>.

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**007** (part 4 of 4) 10.0 points

What angle does this acceleration make with  $\vec{a}_c$ ?

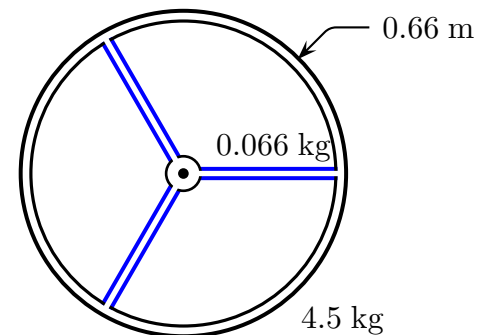
Correct answer: 39.1757°.

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### Spoked Wheel

**008** (part 1 of 2) 10.0 points

A wheel is formed from a hoop of mass 4.5 kg and three equally spaced spokes, each of mass 0.066 kg. The hoop's radius is the length 0.66 m of each spoke.



Find the moment of inertia of the wheel about an axis through its center and perpendicular to the plane of the wheel.

Correct answer: 1.98895 kg · m<sup>2</sup>.

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**009** (part 2 of 2) 10.0 points

Determine the moment of inertia of the wheel about an axis through its rim and perpendicular to the plane of the wheel.

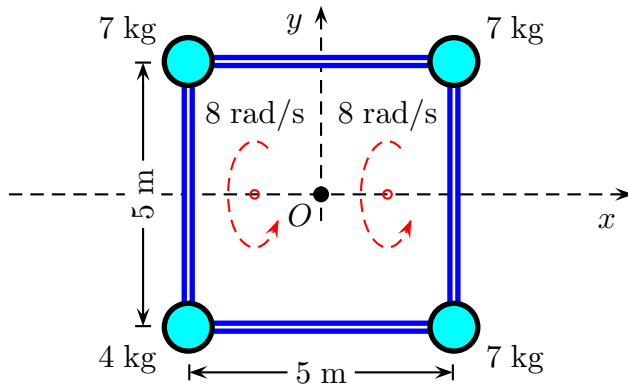
Correct answer: 4.0354 kg · m<sup>2</sup>.

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### Rigid Square System 02

**010** (part 1 of 2) 10.0 points

Four particles with masses 7 kg, 4 kg, 7 kg, and 7 kg are connected by rigid rods of negligible mass as shown. Assume the system rotates in the  $yz$  plane about the  $x$  axis with an angular speed of 8 rad/s.

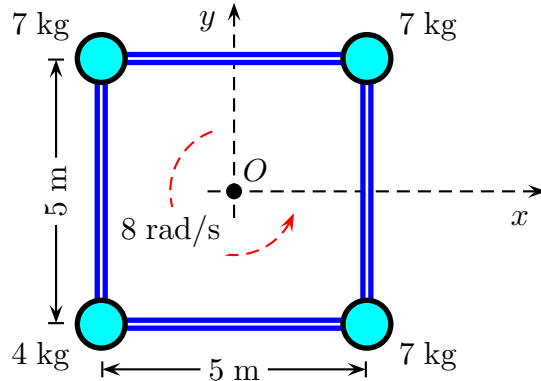


Find the rotational energy of the system about the  $x$  axis.

Correct answer: 5000 J.

**011** (part 2 of 2) 10.0 points

Now assume the system rotates in the  $xy$  plane about the  $z$  axis (origin,  $O$ ) with an angular speed of 8 rad/s.



Find the rotational energy of the system about the  $z$  axis.

Correct answer: 10000 J.