Physics 1 - Final Exam Questions

1. Which of the following has the unit kg·m²/s?

   A) Power

   B) Rotational kinetic energy

   C) Moment of inertia

   D) Angular momentum

   E) Torque

2. As shown below, different wrench lengths are applied to a bolt. Which combination of wrench length

3. A physical pendulum with a mass of m = 3 kg oscillates with small amplitude around an axis h = 0.4 m

   A) $\sqrt{2}$ m

   B) $\sqrt{3}$ m

   C) 0.4 m

   D) $\sqrt{2}/2$ m

   E) 0.2 m

4. If the angular amplitude of the simple pendulum is 0.2 rad, what is its maximum angular acceleration

   A) 1

   B) 1/10

   C) 10

   D) 100

   E) 1/100

5. What is the angular acceleration of the pendulum as it passes through its equilibrium position?

   A) $10\sqrt{2}$

   B) $20/\sqrt{3}$

   C) 0 (At equilibrium, velocity is maximum, and force and acceleration are zero.)

   D) 10

   E) 200

6. For a mass-spring system oscillating frictionlessly, the position-time graph is shown below. Which of

   A) $x(t) = 3 \cos(\pi/4\ t + \pi/2)$

   B) $x(t) = 3 \cos(\pi/4\ t - \pi/2)$

   C) $x(t) = 3 \cos(\pi/8\ t - \pi/2)$

   D) $x(t) = 3 \cos(\pi/8\ t + \pi/2)$

   E) $x(t) = 3 \cos(\pi/8\ t + \pi/4)$

7. What is the velocity of the mass at t = 2 s?

   A) 0

   B) $3\pi\sqrt{2}/8$

   C) $3\pi\sqrt{2}/16$

   D) $3\pi\sqrt{2}/2$

   E) $3\pi\sqrt{2}/4$

8. What is the maximum acceleration of the mass?

A) $3\pi^2/64$

B) $3\pi^2/16$

C) $-3\pi^2/64$

D) $-3\pi^2/16$

E) $-3\pi^2/8$

9. A particle of mass m = 2 kg is launched with an initial velocity v■ = 10 m/s at an angle θ = 45° to the

A) -20 k■

B) 20 k■

C) 0

D) -40 k■

E) 40 k■

10. At the highest point of the particle's trajectory, what is the angular momentum vector relative to poin

A) 50 k■

B) 25/2 k■

C) 0

D) -50 k■

E) $-25\sqrt{2}$ k■

11. Just before the particle hits the ground, what is the angular momentum vector relative to point O, in

A) $-80\sqrt{2}$ k■

B) 80 k■

C) $-100\sqrt{2}$ k■

D) 100 k■

E) -25 k■

12. A bullet of mass 20 g and velocity 300 m/s passes through a stationary solid disk of mass 2 kg and

A) 2.5

B) 2

C) 25

D) 5

E) 20

13. What is the angular momentum of the disk in SI units?

14. What is the kinetic energy of the disk in SI units?

A) 0.15

B) 0.45

C) 1.5

D) 4.5

E) 0.5

15. A pulley of mass m and radius r is wrapped with a weightless string and hangs as shown. The pulle

A) mg/(sinβ + 1)

B) mg/(sinβ - 1)

C) mg/(cosβ + 1)

D) (mg·sinβ)/(cosβ + 1)

E) (mg + 1)/(tanβ)

16. What is the reaction force exerted by the wall?

A) mg·tanβ

B) (mg·cosβ)/(sinβ + 1)

C) mg/cosβ

D) (mg·sinβ)/(cosβ + 1)

E) mg/(tanβ + 1)

17. What is the coefficient of static friction μ■ required for equilibrium?

A) μ■ ≤ 1/sinβ

B) μ■ ≤ tanβ

C) μ■ ≥ 1/sinβ

D) μ■ ≥ tanβ

E) μ■ ≤ cosβ

18. In a spring pendulum experiment, the graph $T^2 = f(m)$ is obtained by studying the dependence of the

A) 120

B) 90

C) 87

D) 56

E) 48

19. A pulley with a mass of 800 g and radius 40 cm is wrapped with a string of length 240 cm. If the pul

A) 8

B) 2.4

C) 3.6

D) 3.2

E) 2

20. How long does it take for the pulley to reach an angular speed of 10 rad/s?

A) 3.2 s

B) 5 s

C) 4 s

D) 2.5 s

E) 2 s