PHYS 201 F2018 Study Guide for Test #3 Chapters 9, 10, and 16

The following page will be the first page, equations sheet.

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| PHYSICS 201 Equations Sheet | Translational Motion | Rotational Motion |
| LINEAR | ANGULAR |
| Time |  t  |  t |
| Displacement |  x; (x = rθ) |  θ |
| Velocity | v = Δx/Δt; (v = rω)  |  ω = Δθ/Δt |
| Acceleration | a = Δv/Δt; (a = rα) |  α = Δω/Δt  |
| Kinematic Equations | v = v0 + at | ω = ω0 + αt |
| x = ½(v + v0)t | θ = ½(ω + ω0)t |
| x = v0t + ½ at2 | θ = ω0t + ½ αt2 |
| v2 = v02 + 2ax | ω2 = ω02 + 2αθ |
| Inertia | *m* = mass | *I* = Rotational inertia; |
| To create | force = F | torque = τ = LA·F |
| Newton's second law of motion   | Σ**F** = m**a** | Σ**τ** = I**α** |
| Σ**F** = Δ**p**/Δt | Σ**τ** = Δ**L**/Δt |
| Work | *F·x* | *τ·θ* |
| Kinetic Energy | Translational Kinetic Energy = TKE = ½ mv2 | Rotational Kinetic Energy = RKE = ½ Iω2 |
| Momentum | **p** = m·**V** |  **L** = I·**ω** |
| Conservation of momentum | Σmivi = Σmfvf | ΣIiωi = ΣIfωf |

Acceleration due to gravity = g = 9.8 m/s2.

Area of a circle of radius r, Acircle = π r2 .
Area of a rectangle of length l, and width w, Arec=l x w;
Area of a triangle, Atriangle= 0.5 x base x height.

Volume of a cylinder of radius r and height h; V= π r2h; Volume of a sphere = (4/3) π r3.

Frictional force = *Ffr=μkFN* GPE = mgh

Hooke’s law: $\vec{F}=-k\vec{x}$ Elastic PE = EPE = $\frac{1}{2}kx^{2}$
Period of a mass (m) hanging from a spring (spring constant = k): $T=2π\sqrt{\frac{m}{k}}$

Period of a simple pendulum of length, L: $T=2π\sqrt{\frac{L}{g}}$

Chapter 9: Statics

Understanding the conditions for equilibrium.

Write down equations by balancing the forces in X and Y directions.

Write down the torque equation for objects in static equilibrium.

Solving problems in static equilibrium.

Chapter-10: Rotational Motion

Rotational Kinematics

1. Angular displacement, angular velocity, and angular acceleration.
2. Solving rotational motion problems using kinematic equations.
3. Relating linear quantities with angular quantities using radius.

Rotational Dynamics

1. Torque, center of gravity, moment of inertia, rotational work, rotational kinetic energy, and angular momentum.
2. Solving problems involving objects in equilibrium using the conditions for equilibrium.
3. Applying Newton’s second law for rotational motion.
4. Conservation of angular momentum.

Chapter-16: Hooke’s law and Simple Harmonic Motion

1. Hooke’s law, period, frequency, and amplitude.
2. Elastic potential energy.
3. Pendulum and resonance.
4. Oscillating mass on a spring.