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Bago University
Department of Physics
First Semester Examination, March 2019

First Year (BSc)
(Chemistry, Mathematics & Geology Specializations)

Phys 1001
General Physics I
Time Allowed: (3) Hours

Answer any Six questions.

- 1 (a) Define projectile and give two examples of projectile. A bomb is dropped from a plane flying with a horizontal velocity of 120 mi/h at an altitude of 1000 ft. How far from the point directly below the plane at the time of release will the bomb land?
(b) How is the centripetal acceleration of a particle in circular motion affected (i) if the speed is doubled and (ii) both the speed and radius are doubled?
- 2 (a) Define Rigid body. Express the relation between torque and moment of inertia. The fly wheel of a motor is accelerated from rest to a speed of 1500 rpm in 5 s. If the flywheel has a moment of inertia of 40 slug-ft². What is the unbalanced torque on the wheel?
(b) Write down the equations of rotational work, power and kinetic energy. A disk rotating at an angular speed of 10 rad/s is slowed down by a uniform angular acceleration to a speed of 4.0 rad/s in 3.0 s. What is the angular acceleration?
- 3 (a) A particle in a circular orbit with a radius of 10 cm and a speed of 0.50 rad s⁻¹ is accelerated uniformly in 5.0 s to a speed of 1.5 rad s⁻¹ while maintaining the same orbit. What is the total acceleration of the particle, (i) before the angular acceleration is initially applied and (ii) at the end of the 5.0 s interval (angular acceleration still applied)?
(b) Express the relation between the angular velocity and the tangential velocity. A particle in a disk rotating with a uniform angular speed of 2.0 rps is 0.20 m from the axis of rotation. What are (i) the tangential speed of the particle and (ii) the angle through which it rotates in 0.5 s?
- 4 (a) Define universal gravitational constant and coefficient of friction. State the laws of friction.
(b) State the Newton's law of gravitation. A 96 lb boy is standing in an elevator. Find the force on the boy's feet when the elevator (i) stands still, (ii) moves downward at a constant velocity of 3 ft s⁻¹, (iii) accelerates downward with an acceleration of 4 ft s⁻² and (iv) accelerates upward with an acceleration of 4 ft s⁻².
- 5 (a) A box that weighs 100 N is being steadily dragged along the floor by a rope that makes an angle 30° with the horizontal. If the tension in the rope is 40 N what is the force of friction? What is the coefficient of friction?
(b) What does refer weightlessness, or the condition of "zero gravity"? A satellite revolves in a circular orbit at a height of 200 km from the surface of earth. If the period of revolution of satellite is 90 min, $G = 6.66 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$ and mean radius of earth is $6 \times 10^6 \text{ m}$, calculate the average density of earth.
- 6 (a) Define potential energy of a spring. A spring with a spring constant of 2.0 lb in⁻¹ is compressed 8.0 in, from its equilibrium position. How much potential energy is stored in the spring?
(b) A horse pulling a plow exerts an average force of 150 lb in plowing a furrow 50 ft long in 2.0 min. What is the average power output of the horse in horsepower?
- 7 (a) Which has greater specific gravity: (i) copper or steel (ii) alcohol or gasoline? A pure gold nugget with a volume of 3 cm³ is placed on a double-pan balance. What would be the volume of the brass weights needed to balance the nugget?
(b) A cube of material 20 cm on a side has a mass of 7.2 kg. (i) Will the cube float in water? (ii) If so, what will be the height of the cube extending above the water surface?
- 8 (a) How many times faster is the speed of light than the speed of sound in air?
(b) What is Doppler effect? The driver of a car blows the horn, which has a frequency of 500 Hz, as it passes by a stationary observer. If the car travels at 60 mi h⁻¹, what is the frequency of the horn as heard by the observer (i) as the car approaches and (ii) as the car recedes? (Assume the speed of sound to be 1088 ft s⁻¹)