PHYS 2050: FINAL EXAMINATION

SEMESTER: FALL

Campus/Centre:	( ) Downtown campus (x) Loa Campus

Examination Days:	TBD	Examination Dates:	TBD
Examination Time:	TBD	Duration:	75 min

Course Abbreviation & Number:	PHYS 2050
Course Title:	General Physics I

Name of Student: ______________________________

Student Number: ______________________________

INSTRUCTIONS TO CANDIDATES

1. This examination consists of 7 pages.
2. There are 16 conceptual and 11 quantitative questions in this examination. Answer ALL questions.
3. **All working must be shown.**
4. **Units must be shown.**
5. A list of selected formulae is provided below.

LIST OF SELECTED FORMULAE

Kinematics equations

$$v = \frac{dx}{dt} \qquad a = \frac{dv}{dt}$$

Center-of-mass

$$\vec{r} = \frac{1}{M}\sum_{i=1}^{N} \vec{r}_i m_i$$

Conservation of energy

$$W_{\text{ext}} = \Delta K_{\text{rot}} + \Delta K_{\text{trans}} + \sum \Delta U$$

Work

$$W = \int \vec{F}\cdot d\vec{s}$$

Newton's 2nd law

$$\sum \vec{F} = m\vec{a}$$

Centripetal

$$a_{rad} = \frac{v^2}{r}$$

Conservation of momentum

$$\vec{p}_i = \vec{p}_f \qquad m\vec{v}_i = m\vec{v}_f$$

Force from potential

$$F_x = -\frac{\partial}{\partial x}U(x)$$

Rotational kinematics

$$\omega = \frac{d\theta}{dt} \qquad \alpha = \frac{d\omega}{dt}$$

Kinetic energies

$$K_{\text{trans}} = \frac{1}{2}mv^2 \qquad K_{\text{rot}} = \frac{1}{2}I\omega^2$$

Gravitational potential energy

$$\Delta U_g = mg(y - y_0)$$

Conservation of kinetic energy in an elastic collision

$$\vec{v}_{1f} + \vec{v}_{1i} = \vec{v}_{2f} + \vec{v}_{2i}$$

Spring potential energy for $x_{eq} = 0$

$$\Delta U_s = \frac{1}{2}k(x^2 - x_0^2)$$

Work-kinetic energy theorem

$$W_{\text{net}} = \Delta K$$

Momentum and impulse

$$\vec{p} = m\vec{v} \qquad \vec{J} = \int \vec{F}dt = \Delta\vec{p}$$

Volume density

$$\rho = \frac{dm}{dV}$$

Pressure

$$p = \frac{dF_\perp}{dA}$$

Torque

$$\vec{\tau} = \vec{r}\times\vec{F} \qquad \Sigma\vec{\tau} = I\vec{\alpha}$$

Simple fluid eqs.

$$p = p_0 + \rho g h \qquad A_1 v_1 = A_2 v_2 \qquad \frac{dV}{dt} = Av$$

Conservation of angular momentum

$$\vec{L}_i = \vec{L}_f \qquad I_i\omega_i = I_f\omega_f$$

Surface density

$$\sigma = \frac{dm}{dA}$$

Line density

$$\lambda = \frac{dm}{d\ell}$$

Moment-of-inertia

$$I = \sum m_i r_i^2 \qquad I = \int r^2 dm$$

Traveling waves

$$y(x,t) = A\cos(kx - \omega t)$$

Beat freq.

$$f_{\text{beat}} = f_a - f_b$$

Wave speed

$$v = \lambda f = \frac{\omega}{k} \qquad v_{\text{string}} = \sqrt{\frac{F}{\mu}} \qquad v_{\text{sound}} = \sqrt{\frac{B}{\rho}}$$

Bernoulli's equation

$$\rho_1 + \rho g y_1 + \frac{1}{2}\rho v_1^2 = \rho_2 + \rho g y_2 + \frac{1}{2}\rho v_2^2$$

Wave parameters

$$k = \frac{2\pi}{\lambda} \qquad \omega = 2\pi f$$

Standing sound waves

$$f_n = \frac{nv}{2L} \quad (n = 1,2,3,\ldots)\ [\text{open}]$$
$$f_n = \frac{nv}{4L} \quad (n = 1,3,5,\ldots)\ [\text{stopped}]$$

Gravitation

$$F_g = G\frac{m_1 m_2}{r^2} \qquad U_g = -G\frac{m_1 m_2}{r}$$

Doppler

$$f_L = \frac{v_{\text{sound}} + v_L}{v_{\text{sound}} + v_S} f_S$$

Harmonic motion

$$\omega_{\text{spring}} = \sqrt{\frac{k}{m}} \qquad \omega_{\text{pend}} = \sqrt{\frac{g}{\ell}}$$

Mean free path

$$\lambda = v t_{\text{mean}} = \frac{V}{4\pi\sqrt{2}r^2 N}$$

Ideal gas

$$pV = nRT \qquad pV = NkT$$

Gas energy

$$\frac{1}{2}mv_{\text{rms}}^2 = \frac{3}{2}kT$$