# University of Asia Pacific
## Department of Basic Sciences and Humanities
## Final Examination, Spring-2012
## Program: B.Sc Engineering (Civil)

Course Title: Physics I | Course Code: PHY-101 | Credit: 3.00
Time: 3.00 Hours | Full Mark: 150

*[N.B- The figures in the margin indicate full marks. There are two sections in the question paper namely "**SECTION A**" and "**SECTION B**". Answer from both sections according to the instruction mentioned in each section.]*

### SECTION A

There are **FOUR** questions. Answer any **THREE**

Marks

1. (a) Derive the necessary conditions for the formation of Newton's ring by reflected and transmitted light. 15

   (b) A thin equiconvex lens of focal length 4 metres and refractive index 1.5 rests on and in contact with an optical flat and using light of wavelength 5460 Å. Newton's rings are viewed normally by reflection. What is the diameter of the 5th bright ring? 10

2. (a) What is interference of light? 5

   (b) Describe the conditions for constructive and destructive interference by deriving the intensity equation $I = 4a^2 \cos^2 \frac{\delta}{2}$. 20

3. (a) Prove the equation of Newton's formula for velocity of sound in gasses; $V = \sqrt{\frac{P}{\rho}}$, where the symbols have their usual meanings. 15

   (b) Discuss the effect of temperature on the velocity of sound in gas. 10

4. (a) Derive the equation of Doppler effect when the observer at rest and source in motion. 15

   (b) Two trains traveling in the opposite direction at 100 km/hr each, cross each other while one of them is whistling. If the frequency of the note is 800 Hz, find the apparent pitch as heard by an observer in the other train: 10
   (i) before the trains cross each other
   (ii) after the trains have crossed each other

*[Turn over*

## SECTION B

There are **FOUR** questions. Answer any **THREE**

Marks

5. (a) Derive the necessary conditions under which elliptically and circularly polarized light are formed by deriving the general equation of ellipse, $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{2xy}{ab}\cos\delta=\sin^2\delta$. 15

(b) Show that at Brewster's angle the reflected and refracted rays are at right angles to each other. 10

6. (a) Prove the law of Malus, $I \propto \cos^2\theta$, where the symbols have their usual meanings. 15

(b) Write short notes on half and quarter waveplate. 10

7. (a) Show that the moment of inertia of a ring is $I = MR^2$, where the symbols have their usual meanings. 15

(b) A solid sphere of mass 1 kg and radius 0.25 m rolls without slipping with a uniform velocity of 0.1 m/s along a straight line on a horizontal table. Calculate its kinetic energy. 10

8. (a) Show that the moment of inertia of a uniform rod is $\frac{1}{12}ML^2$, where the symbols have their usual meanings. 15

(b) A thin metal ring of diameter 0.6 m and mass 1 kg starts from rest and rolls down an inclined plane. Its linear velocity on reaching the foot of the plane is 5 m/s. Calculate (i) the moment of inertia of the ring and (ii) the kinetic energy of rotation at that instant. 10