Nepal College of Information Technology

**Unit Test**

Fall 2013

Program : BE IT Time : 2 hrs

Semester : (I) FM : 70

Subject : Physics PM : 35

* *Candidates are requested to give their answer as far as practicable in their own words.*
* *The figure in the margin indicates the full marks*
* ***Attempt ALL question***

1. Derive the time period of oscillation of a compound pendulum. Show that the points of suspension and oscillation are interchangeable. (5+4)

2. Establish a relationship between phase velocity and wave velocity. Explain how the nodes and antinodes are formed in a standing wave due to superposition of two sinusoidal waves. (4+5)

3. Explain the reason behind colored fringes in thin films? Derive the wavelength of a monochromatic source of light using the Newton’s Ring Experiment. (3+6)

4. Explain Gauss’s law in electrostatics for linear, planar and spherical symmetry. Charge is distributed uniformly throughout an infinitely long cylinder of radius R, find an expression for electric field, E at a distance r from the cylinder axis (r<R). (3+6)

5. How medium affects the electrostatics force between two charges? Establish a relationship between three electric vectors D, E and P with their usual meanings. (2+7)

6. A soap film 5×10-5 Cm thick is viewed at an angle of 350 to the normal. Find the wavelengths of light in the visible spectrum which will be absent from the reflected light if the refractive index of the soap film is 1.33. (6)

7. A body of mass 0.01 Kg is attached to a spring of force constant 5N/m. The motion starts from rest by displacing the body 0.01 m to the right releasing it. Calculate (i) frequency (ii) amplitude (iii) initial phase (iv) total energy and (v) maximum velocity.

OR

If the earth were a homogenous sphere of radius R and a straight hole were bored in it through its centre. Show that a particle dropped into the hole will execute a simple harmonic motion about the centre of earth and find its time period. (Radius of the earth R=6400Km) (6)

8. A plane transmission grating having 6000 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between the two sodium lines whose wavelengths are 5890A0 and 5896A0. (6)

9. Write short notes (On Any Two): (4×2=8)

a) Production of Ultrasound

b) Optical Fiber Communication

c) He-Ne Laser