NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Unit test

Program: BE   Full Marks : 70

Pass Mark : 45

Course: Physics   Time   : 2 hrs

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Under what condition is the motion of a compound pendulum is simple harmonic? Derive its time period. Show that point of suspension and point of oscillation are interchangeable. (3+3+3 =9)

    b) Calculate the ratio of intensity of following two waves: $y_1=6 \sin(0.4t-25x)$cm and $y_2= 2.5\sin(3.2t-200x)$cm. (6)

2. a) What aspect of light is demonstrated by interference? Discuss analytical treatment of interference on the basis of intensity and phase difference. (2+7)

    b) A parallel beam of monochromatic light is allowed to be incident normally on a plane grating having 1250 lines per cm and a second order spectral line is observed to be deviated through 30 degrees. Calculate the wavelength of the spectral line. (6)

3. a) Diffraction occurs for a wave. Is it true? If yes, then for what type of wave? Discuss Fraunhoffer diffraction through a single slit. Hence show that width of the central maxima is double the width of the secondary maxima. (2+3+4 =9)

    b) A stretched string has a linear density 525 gm/m and is under tension of 45 N. A sinusoidal wave with frequency 120 Hz and amplitude 8.5 mm is sent along the string from one end. At what average rate does the wave transport energy? (6)

4. a) Distinguish between the particle velocity and the phase velocity. (9)
Show that for a plane progressive wave, the intensity is constant while for a spherical wave it decreases with the square of the distance.

b) Show that if the displacement of a moving point at any time is given by an equation of the form $x = a \cos\omega t + b \sin\omega t$ the motion is simple harmonic. For $\omega = 2$ rad/s, determine the period. (6)

5. Write short notes on **any two:** 2x5 =10

a) Wave plate
b) Mass-spring system
c) Newton's rings