United International University

School of Science and Engineering

Assignment-2; Year 2023; Semester: Spring

Course: PHY 2105; Title: Physics, Section: D

1. Draw displacement vs time graph for $\omega/\gamma = 10$, $\omega/\gamma = 0.5$, and $\omega/\gamma = 0.03$.

2. In oscillatory circuit L= 0.4h, C = 0.0020μF. (i) What is maximum value of resistance (R) for the circuit to be oscillatory? and (ii) What is its resonant frequency?

3. Find whether the discharge of capacitor through the following inductive series circuit is oscillatory or not. Given, C = 0.1μF, L = 10mh, and R 200 Ω. If oscillatory, find the frequency of oscillation and resonant frequency. If it is parallel circuit, then find out the similar characteristics of that circuit.

4. For a damped oscillator m =250gm, k = 85N/m and b = 70gm/s. (i) What is the period of the motion? (ii) How long does it take for the amplitude of the damped oscillations to drop to half its initial value? (iii) How many oscillations does it complete in life time? (iv) What is its life time? (v) The maximum displacement of undamped oscillator is 35 cm. If the damping is stopped after 20 cycles, What is the damping energy? (vi) What is the ratio of the oscillation amplitude to the initial oscillation amplitude at this cycle?

5. The equation of a travelling wave is $y = 4.0\sin(0.10x - 2t)$. Find (i) amplitude, (ii) wavelength, (iii) speed, and (iv) frequency of wave.

6. At time t=0 the displacement of a particle in a medium is $y = 4.0\sin 2\pi(\frac{x}{100})$ and the velocity of wave is 30cm/s. Find the displacement equation when t = 3s.

7. When a simple harmonic wave is propagated through a medium, the displacement of the particle at any instant of time is given by $y = 5.0sin\,\pi(360t - 0.15x)$. Calculate (i) the amplitude of the vibrating particle, (ii) wave velocity, (iii) wave length, (iv) frequency and (v) time period.

8. A simple harmonic wave of amplitude 8units travels a line of particles in the direction of positive X axis. At any instant for a particle at a distance of 10cm from the origin, the displacement is +6units and at a distance a particle from the origin is 25units, the displacement is +4units. Calculate the wavelength.

9. Determine the length and frequency of a simple pendulum that will swing back and forth in simple harmonic motion with a period of 5.00 s.

10. Find out the resultant amplitude, node and antinode points in terms of λ of the following equations: $y_1 = A\cos(\frac{1}{3}kx + \omega t)$ and $y_2 = A\cos(\frac{1}{3}kx - \omega t)$.

11. Two cosine waves have phase velocity C_1= 2 cm/s, C_2= 3 cm/s, and corresponding wavelength λ_1 =4 cm, λ_2 =3 cm. Find out the angular frequency and group velocity.

12. If a RLC series circuit producing FHM has R=2Ω, L=1mH and C=0.4μF. Calculate (i) ω_o, (ii) ω_1 and ω_2, (iii) Q and β, and (iv) the amplitude of the current at ω_o, ω_1 and ω_2.

13. If a RLC parallel circuit producing FHM has R=8kΩ, L=0.2mH and C=8μF. Calculate (i) ω_o, (ii) Q and β, (iii) ω_1 and ω_2, and (iv) Power dissipated at ω_o, ω_1 and ω_2.

14. Rank the waves represented by the following functions from the largest to the smallest according to (i) their amplitudes, (ii) their wavelengths, (iii) their frequencies, (iv) their periods, and (v) their speeds. For all functions, x and y are in meters and t is in seconds. (a) y = 4 sin (3x - 15t), (b) y = 6 cos (3x + 15t - 2), (c) y = 8 sin (2x + 15t), (d) y = 8 cos (4x + 20t), and (e) y = 7 sin (6x - 24t).

15. Suppose the displacement of a DHM is expressed as $x = Ae^{-\alpha t}\cos(\omega_d t + \delta)$. Show that total energy of DHM $E = E_o e^{-2\alpha t}$.