United International University

School of Science and Engineering

Quiz#02; Year 2021; Semester: Summer
Course: PHY 105; Title: Physics
Full Marks: 20; Section: A; Time: 30 minutes

Name:	ID:	Date:

1. The solution of spring mass dampers DHM equation can be represented as $x = x_m e^{-\alpha t} cos(\omega_d t + \delta)$. (i) Write down the complete mathematical equation for ω_d and α. (ii) Write down the differential equation of DHM in electrical circuit. (iii) Write down the equation for damping amplitude and damping energy in a DHM. **1.5**

2. The maximum displacement of two damped harmonic oscillators found initially is A= 4m. Now, draw the displacement vs. time graphs for (i) ω/γ = 0.25 and (ii) ω/γ = 2. **1**

3. A condenser of capacity 10 μF, an inductance of 0.2 mH and a resistance of 600 Ω are joined in series. (i) Which type of oscillation it is? (ii) What is the damping frequency, if any? and (iii) What is its resonant frequency f_o, if any? **2.5**

4. For a damped oscillator circuit, a copper wire spring having mass m =250 g, k = 83 N/m, b = 70 g/s, is connected with a capacitor with capacitance C = 0.03 F. Therefore the corresponding inductance is found as L= 0.1 H. Now, find out (i) the period of the motion, (ii) the maximum value of resistance R if the resistance is connected of the circuit for which it would be oscillatory, (iii) the resonant frequency, if any, when R is connected in the circuit, (iv) What is its life time? and (v) How long does it take for the mechanical energy to drop to one-quarter its initial value? **2.5**

5. Suppose the dynamics of a simple pendulum is represented as $= -4cos(\omega t + \delta)$. The effective length of simple pendulum is 27 cm. Calculate (i) the angular frequency, (ii) time period, (iii) frequency, (iv) maximum acceleration, and (v) instantaneous displacement for t=5s. Given, the pendulum is pulled a distance and released from equilibrium at t = 0. **2.5**