বাংলাদেশ আর্মি ইন্টারন্যাশনাল ইউনিভার্সিটি অব সায়েন্স অ্যাণ্ড টেকনোলজি (বিএআইইউএসটি) কুমিল্লা
Bangladesh Army International University of Science and Technology (BAIUST) Comilla

Mid-Term Examination, Spring 2023

Department of Electrical & Electronic Engineering
Level-1, Term-II
Course Code: PHY 121
Course Title: Physics II
Credit Hour: 3.00

Time : 1 hr.
Full Marks : 60

Note:

a. Figure on the right of each question indicate marks for respective question.

Answer any two questions including Question No 1.

01. a. Given a particle undergoing simple harmonic motion, denoted by position x_1 with velocity v_1 and position x_2 with velocity v_2, **show that** the relationship between the time period (T) and the amplitude (A) of this motion, thereby determining their ratio is- 14

$$\frac{T}{A} = 2\pi\sqrt{\frac{x_2^2 - x_1^2}{v_1^2 x_2^2 - v_2^2 x_1^2}}$$

b. **Illustrate** the response of the acceleration, kinetic energy, and potential energy of a particle experiencing simple harmonic motion (SHM), when it is situated at its mean position(x=0). 06

c. Which of the following represent simple harmonic motion? 10
(i) $x = A \sin \omega t + B \cos \omega t$
(ii) $x = A\, e^{i\omega t}$
justify your answer along with a valid explanation.

02. a. **Establish** the mathematical expression for the time period (T) of a spring mass system when they are connected in a series combination. 07

b. **Find** the total energy of a particle executing simple harmonic motion. 15

c. **Explain** the Damped harmonic oscillation and **mention** its type. 08

03.	a.	**Identify** the characteristic of a progressive wave.	08
	b.	**Differentiate** between phase velocity and group velocity.	10
	c.	**Formulate** a correlation between the phase velocity and the group velocity and hence **discuss** how they response in a dispersive medium.	12