VIT
Vellore Institute of Technology

Continuous Assessment Test-1 (CAT-1), (November 2022)

Programme	: B.Tech.	Semester		: Fall 2022-23
Course	: Engineering Physics	Code		: BPHY101L
Faculty	: Dr. N. Punithavelan	Slot & Class Number		: D1
				CH20222231700355
Time	: 1½ Hours	Max. Marks		: 50

Answer any five Questions   Total Marks: 5 x 10 Marks = 50

Q. No.	Question Text	Marks
1	Derive wave equation for waves produced on a string and confirm its solutions.	10
2	Derive equation for a standing wave formed on a string tied at both the ends. Express the frequency and wavelength for the first three orders of vibrations in terms of the length of the string.	10
3	a. A string having length 4 m and mass 0.16 kg, is disturbed to vibrate with a tension force of 400 N. (1) What is the linear density of the string? (2) Predict the wave velocity; 3. Determine the frequency of the wave if it has a wavelength of 0.5 m. (5 marks) b. If a progressive wave equation is written as $y(x,t) = 0.1 \sin\left(350t - \frac{x}{5}\right)$; where x, y are in meters and t in seconds, then estimate (1) the maximum velocity of the particle in the wave (2) the maximum acceleration of the particle in the wave (3) Wavelength of the wave. (5 marks)	10
4	Derive the equation for electromagnetic waves through empty space using Maxwell's equations in electromagnetism in terms of electric field and magnetic field vectors.	10
5	a. Calculate the divergence and curl of $\vec{A} = 4x^4 z\hat{\imath} + (3x - 2y)\hat{k}$ (5 marks) b. Explain the Hertz experiment in proving the existence of Electromagnetic waves with the necessary experimental diagrams. (5 marks)	10
6	Write the differential form of Maxwell's equations and explain the parameters used with their units. (6 marks) Explain the physical meaning of curl and divergence in electromagnetism. (4 marks)	10