VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test (CAT - I), November 2022

Programme	: B.Tech	Semester	:	Fall 2022-2023
Course Title	: Engineering Physics	Course Code	:	BPHY101L
School	: School of Advanced Sciences	Slot	:	C2+TC2
Duration	: 90 mins	Max. Marks	:	50
Class No	: 5693, 5887, 5673, 5720, 5726, 5746, 5705, 5768, 5733			

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks
1	Derive the equation of a transverse wave on a stretched string of mass per unit length ρ and tension T. Mention the key assumption that was required to be taken to derive the wave equation. (7) From the viewpoint of dimensional analysis show that $\sqrt{\frac{T}{\rho}}$ indicates the wave velocity as defined by the above wave equation. (3)	10
2	State the difference between longitudinal and transverse wave and explain your answer with an example for each kind of waves. (4) How will the amplitude, velocity, and phase of wave changes when it reflects from the end of a string fixed on a wall? (6)	10
3	(a) Explain the properties of standing waves created on a stretched string of finite length fixed at both ends. Draw the fundamental frequency and fourth harmonics of standing waves on a string with a figure showing nodes and antinodes. (5) (b) Calculate the tension on a stretched 1 m length wire having a linear density of 0.01 kg/m and oscillating with fundamental frequency 60 Hz. Find the distance between the nodes of the string when it oscillates with 3rd Harmonic frequency. (5)	5 5
4	Write down Maxwell's equations in differential and integral form, mentioning the various notations and the significance of each equation. (4) Why Amperes law was modified to include the displacement current term in Maxwells equation. (6)	10
5	(a) From Maxwell's equations, in charge and current free space, derive the electromagnetic wave equations for electric and magnetic field vectors. (5) (b) Test if the following vector represents a magnetic field vector from the Maxwells equations by calculating the divergence of the following vector: $\vec{B} = x\,\hat{\imath} + 2y\,\hat{\jmath} - 3z\,\hat{k}$ (5)	5 5