



# VIT

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

## Continuous Assessment Test (CAT - I), March 2023

Programme	: B. Tech	Semester	: Winter 2022-2023
Course Title	: Engineering Physics	Course Code	: BPHY101L
School	: School of Advanced Sciences	Slot	: B1+TB1
Duration	: 90 mins	Max. Marks	: 50
Class No	: 4931, 4933, 4925, 4917, 4923, 4919, 4927, 4921		

Part - A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks
1	Derive the one-dimensional wave equation of a stretched string and discuss about its general solution.	10
2	Obtain a standing wave equation created on a string with fixed ends. Discuss the change in wavelengths and angular frequencies for first four harmonics.	10
3	(a) What is characteristic impedance (Z) of a string? Discuss the scenario if the wave encounters different boundaries where (i) $Z = 0$ & (ii) $Z = \infty$ . (b) $y(x,t) = 3.0 \sin(36t + 0.018x + \pi/4)$ is a transverse harmonic wave on a string where x and y are in cm and t in s. Find its (i) propagation speed (ii) amplitude (iii) frequency (iv) initial phase at origin and (v) What is the distance between two successive crests in the wave?	5
4	Derive the wave equation in free space from Maxwell's equation for both electric and magnetic field. Compare them with classical wave equation and give your inference.	10
5	(a) Discuss about displacement current based on the derivation of Ampere's law corrected by Maxwell for electromagnetic waves. (b) (i) Find out whether the following vector field is solenoidal or not. $\mathbf{F}(x, y) = 3x^2\mathbf{i} - 6xy\mathbf{j}$ . (ii) Find out whether the following vector field is irrotational or not. $\mathbf{F}(x, y, z) = x\mathbf{i} - y\mathbf{j} + z\mathbf{k}$ .	5