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

Continuous Assessment Test I – November 2022

Programme	:	B.Tech.	Semester	:	Fall 2022-2023
Course	:	Engineering Physics	Code	:	BPHY101L
			Slot	:	D1+ TD1
Faculty	:	L J Kennedy, Atanu Dutta, G.Vinitha, Caroline Ponraj, Ramkumar M C, Karthikeyan S, Swaathi P	Class number	:	CH2022231700327, CH20222317003 CH2022231700560, CH20222317003 CH2022231700303, CH20222317003 CH2022231700309.
Time	:	90 minutes	Max. Marks	:	50

Answer any FIVE Questions only (5 x 10 = 50)

Q.No	Questions	Marks
1	Derive the wave equation for a flexible string of length l that is tightly stretched between two fixed points.	10
2	Prove that, $y = 5\sin(6\pi t - 4x)$ is a valid wave equation in a string vibration. Also find i) frequency, ii) wavelength, iii) velocity and iv) tension in the string, if the mass per unit length of the string is 0.5 kg/m.	10
3	Draw the figure representing the incidence, reflection and transmission of waves at a boundary with two strings having different linear mass density. Also write down the following i. equations for incident, reflected and transmitted waves. ii. reflection & transmission coefficient of the amplitudes in terms of z iii. reflection & transmission coefficient of the amplitudes in terms of k and ρ.	10
4	a) Find the gradient of the function $f(x,y) = 24x^3 + 3y^2 + 9, \quad at\ point\ (-1,2)$ b) Find the divergence and curl of the vector field at the given point $\vec{F} = 12x^5z^3\hat{\imath} + 5xyz^4\hat{\jmath} + 3xy^6z\hat{k}, point(1,-1,1)$ c) Interpret your answers obtained from the above functions for gradient, divergence and curl with their physical meaning.	10
5	a) Write down Maxwell's equations in differential and integral form. b) What do the four Maxwell's equations describe? c) Explain the symbols and parameters used in these equations.	10
6	Using Maxwell's equation for free space, derive the plane electromagnetic wave (EM) equation for free space in terms of electric and magnetic field vector. Also show how one can arrive at the velocity of the EM wave.	10

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