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

Continuous Assessment Test (CAT - I), August 2024

Programme	:	**B.Tech**	Semester	:	**Fall 2024-2025**
Course Title	:	**Engineering Physics**	Course Code	:	**BPHY101L**
School	:	**School of Advanced Sciences**	Slot	:	**B2**
Duration	:	**90 mins**	Max. Marks	:	**50**
Class No	:	**5969, 5993, 7898, 6897**			

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks	CO	BL
1	Derive the one-dimensional wave equation for an elastic string of tension, **T**, and linear density, **μ**, undergoing transverse vibrations along y-axis and propagating along x-axis. Also write the possible solutions of the wave equation.	10	CO1	BL2
2	Two strings of same tension but different linear densities (μ_1 and μ_2) are joined. Write expressions for amplitude reflection coefficients (**r**) and amplitude transmission coefficient (**t**) in terms of (i) speed of the wave (**v**) and (ii) impedance of the string (**Z**). Calculate **r** and **t** when (i) $\mu_2 = \infty$ (ii) speed of wave in first string (v_1) is double that of the second string, and draw the incident, reflected and transmitted waves.	5 5	CO1	BL3
3	Write the expression for a stationary wave produced by a string of length **L**, fixed on both the ends, and sketch the wave patterns of the first three harmonics. A long string of linear density 1 g/cm is joined to another long string of linear density 4 g/cm and the combination is held under constant tension. A transverse sinusoidal wave of amplitude 3 cm and wavelength 25 cm is launched along the lighter string. Calculate the wavelength and amplitude of the wave when it is travelling along the heavier string.	5 5	CO1	BL3
4	Write the physical significance of divergence of a vector ($\nabla . A$) and curl of a vector ($\nabla \times A$). Extend the same arguments to four Maxwell's equations in their differential form.	10	CO1	BL2
5	What was correction made by Maxwell to Ampere's law and what is its significance? Starting with Maxwell's IV law in differential form, describe how Maxwell's contribution leads to the conclusion that a traveling electric field wave in the vacuum has a speed equal to velocity of light.	5 5	CO1	BL2