



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1974)

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025

REG.NO.: 24BC10025

SLOT: E1+TE1

Programme Name & Branch : B. Tech

Course Code and Course Name : BPHY101L, Engineering Physics

Faculty Name(s): ABHISHEK KUMAR SINGH, JITENDRA KUMAR BEHERA, SRIDHAR S, SANGEM RAJESH, DHANOJ GUPTA, ANUJ RAM BAITHA, BHASKAR SEN GUPTA, SAMUEL P, DEEPAK BHAT, PREMKUMAR S, LAXMI NARAYAN TRIPATHI, AMRITA DEY, SAMIR RANJAN MEHER, KRISHNA CHANDAR N, VIJAYA CHAMUNDEESWARI S P, VISHWA BANDHU PATHAK, ABHINAV ANAND, KURAGANTI, SUMANGALA T P, KANHAIYA LAL PANDEY, SURESH KUMAR VANDRANGI, ANUSHA P T, SHOBANA M K

Class Number(s): 5298, 5307, 5283, 5270, 5280, 5276, 5262, 5274, 5285, 5305, 5303, 5257, 5273, 5291, 5266, 5294, 5264, 5278, 5260, 5289, 5301, 5271, 5287

Date of Examination : 31 January 2025, Session 1(9:30-11:00 am)

Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes:
CO1: model the waves in an elastic medium using Newtonian mechanics.
CO2: explain the properties of electromagnetic waves using the Maxwell's equations.

Q. No	Question	M	CO	BL
1.	Enlisting the suitable assumptions, derive the wave equation for a one-dimensional mechanical wave on a string with suitable diagram. By checking the dimensionality, deduce the speed of the wave.	10	1	2
2.	(a) Differentiate transverse and longitudinal waves, with suitable diagrams and examples. Describe the nature of the surface waves in the water.	5	1	2
	(b) Prove that $f(z - vt)$ is a valid wave function for a one-dimensional mechanical wave propagating in z direction with speed v .	5		
3.	(a) An incident harmonic wave of amplitude 0.5 mm is propagating from a string of mass-per-unit-length 0.04g/cm to another joint string of mass-per-unit-length 0.09g/cm. Calculate the reflection and transmission coefficient of the strings. What will the amplitude and phase of the reflected and transmitted wave?	5	1	3
	(b) A standing wave with 2 antinodes is formed on a string of length 10 cm, with both the ends fixed. Draw the wave form. If the mass-per-unit-length of the string is 0.04 g/cm and tension is 10 N, calculate the wavelength, frequency and the speed of the right-side-propagating-wave in SI units.	5		
4.	Write the Maxwell's equations in free space, with proper definitions of the parameters. Derive the wave equation for the electric and the magnetic field in free space. Deduce the speed of the wave in free space.	10	2	2
5.	(a) Describe the Gauss Divergence theorem with suitable mathematical expressions and diagrams. In the context of electromagnetic theory discuss its physical significance.	5	2	2
	(b) Explain the inconsistency in Ampere's law. Deduce an expression for the correct term to complete the Ampere's law.	5		
