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

REG.NO.:

SLOT: F2+TF2

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2025-2026

Programme Name & Branch : B.Tech. (SCOPE)
Course Code and Course Name : BAPHY105- Engineering Physics
Faculty Name(s) : Anuj Ram Baitha, Samir Ranjan Meher, Rambabu Yalavarthi, Abhinav Anand, Laxmi Narayan Tripathi, Pankaj Sheoran, Kanhaiya Lal Pandey Sridhar S., Ankush
Class Number(s) : VL2025260503669, 3671, 3673, 3675, 3677, 3679, 3681, 3683, 3685.
Date of Examination : 01/02/2026
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: Identify limitations of classical physics through experimental observations.
CO2: Apply matrix algebra and Dirac notation for the understanding of quantum mechanical problems involving linear operators, eigenvalues, and eigenvector.

Q. No	Question	Module	Marks	CO	BL
1.	Draw the blackbody spectra for an object kept at three different temperatures T_1, T_2, and T_3 ($T_3>T_2>T_1$). Discuss the Ultraviolet catastrophe with appropriate diagram and explain how Planck's hypothesis resolved it.	1	10	1	2
2.	What are matter waves? Describe an experiment that can demonstrate the concept of dual nature of matter, using appropriate diagrams.	1	10	1	2
3.	a) Elucidate and analyse the experiment that led to the discovery of quantized electronic spins.	1	5	1	3
	b) Determine the ratio of the corresponding wavelengths of a moving electron and a photon if both have same energy.	1	5		
4.	a) What conditions must a set of vectors satisfy to be called a *linear vector space*? Explain with suitable examples.	2	5		
	b) Consider the following two vectors: $\|\psi\rangle = \begin{pmatrix} 5i \\ 2 \\ -i \end{pmatrix}$, $\|\phi\rangle = \begin{pmatrix} 3 \\ 8i \\ -9i \end{pmatrix}$ Find $\|\psi\rangle^*$ and $\langle\psi\|$	2	5	2	3
5.	a) Given vectors $\|u\rangle = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \in R^2$ and $\|v\rangle = \begin{pmatrix} 3 \\ 4 \\ 5 \end{pmatrix} \in R^3$, find the tensor product $u \otimes v$ and its dimension.	2	4	2	3

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	b) Consider the states: $\|\psi>=\frac{1}{\sqrt{5}}i\|\alpha>+2\|\beta>$ and $\|\phi>=\frac{1}{\sqrt{3}}\|\alpha>+i\|\beta>$ where the two vectors, $\|\alpha>$ and $\|\beta>$ form a complete and orthonormal basis. (i) Check whether $\|\psi>$ and $\|\phi>$ are normalized functions. (ii) Calculate the inner product $<\psi\|\phi>$	2	6		

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