



VIT

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

REG. NO.: 2025AEC0137

SCHOOL OF ADVANCED SCIENCES CONTINUOUS ASSESSMENT TEST - I WINTER SEMESTER 2025-2026

SLOT: C2+T02

Programme Name & Branch : B.Tech
Course Code and Course Name : BAPHY105 - Engineering Physics
Faculty Name(s) : Prof. GOPAL, Prof. KRISHNAMOORTHY, Prof. PREMKUMAR, Prof. SAMUEL, Prof. SARAVANAN, Prof. SOUMYA, Prof. UMMAL MOMEEN
Class Number(s) : VL2025260503654, VL2025260503656, VL2025260503657, VL2025260503660, VL2025260503664, VL2025260503667, VL2025260504783
Date of Examination : 29-01-2026
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 : 1 - Identify limitations of classical physics through experimental observations. 2 Apply matrix algebra and Dirac notation for the understanding of quantum mechanical problems involving linear operators, eigenvalues and eigenvectors.

Q. No	Question	M	CO	BL
1.	Explain the concept of wave-particle duality of electrons using the Young's Double Slit Experiment, with a schematic diagram and discussion.	10	1	2
2.	Define the term 'spin' in the context of a Stern-Gerlach experiment. Using schematic diagram discuss the key insights and deductions of this experiment.	10	1	2
3. a)	Calculate the de-Broglie wavelength of an electron moving with a kinetic energy of 54 eV.	5	1	3
b)	A black body is at a temperature $T = 2727^{\circ}\text{C}$. Using Planck's law of Blackbody radiation, calculate the spectral radiance per unit wavelength at wavelength $\lambda = 1.0 \mu\text{m}$.	5		
4.	Define a Hilbert space. Write down the important properties of the Hilbert space. How should one define a set of orthonormal basis vectors for a linear vector space?	10	2	2
5. a)	Check whether the following three vectors are mutually orthogonal. Normalize them to construct an orthonormal set. $\vec{v}_1 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \vec{v}_2 = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}, \vec{v}_3 = \begin{pmatrix} 0 \\ 0 \\ 2 \end{pmatrix}$	5	2	3
b)	Determine whether the following vectors are linearly independent or dependent $\vec{v}_1 = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \vec{v}_2 = \begin{pmatrix} 2 \\ 5 \\ 8 \end{pmatrix}, \vec{v}_3 = \begin{pmatrix} 3 \\ 7 \\ 9 \end{pmatrix}$	5		