VIT

Vellore Institute of Technology

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

REG.NO.:

NAME OF THE SCHOOL

CONTINUOUS ASSESSMENT TEST - II

FALL SEMESTER 2024-2025

SLOT: C2+TC2

Programme Name & Branch : B.Tech

Course Code and Course Name : BPHY101L and Engineering Physics

Faculty Name(s) : Dr.Murali. R, Dr. Rajanbabu D, Dr. Ramasubramanian V, Dr., Anuradha C, Dr. Soumya Chakrabarti, Dr. Deepak Bhat, Dr.Ummal Momeen M, Dr. Shobana M.K, Dr. Sangem Rajesh

Class Number(s) : 7420, 5973,5989, 5981, 5997. 6004, 6842, 6250, 6239

Date of Examination : 15.10.2024

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)
- CO3- **apply** quantum mechanical ideas to microscopic systems.

Q. No	Question	M	CO	BL
1.	What is the need for quantum mechanics? Explain Planck's hypothesis. How idea of quantization supported to resolve the UV catastrophe in the block body spectrum? Discuss in detail with suitable diagrams.	10	CO3	BL3
2.	How matter waves are different from electromagnetic waves? Describe the experiment which proves the wave nature of electrons with a suitable diagram.	10	CO3	BL3
3.	a) In a Compton scattering experiment, the incident X-rays have a wavelength of 3.12 Å and are scattered by free electrons in graphite. The scattering angle is $\theta=135°$. What is the (i) energy and (ii) momentum of the scattered photon?	5	CO3	BL3
	b) The uncertainty in the momentum of a ball traveling at 20 m/s is 1×10^{-6} of its momentum. Calculate the uncertainty in position. The mass of the ball is 0.5 kg.	5		
4.	a) An electron is bound in a one-dimensional box of size 1 Å. Find the eigenvalues in the ground state and first two excited states. What is the energy difference between the ground and the second excited state?	5	CO3	BL3
	b) A particle is described by the wave function $\Psi=\sqrt{\frac{2}{L}}\sin\left(\frac{2\pi x}{L}\right)$ for $0 \le x \le L$. Determine the probability of finding the particle near $L/2$, by calculating the probability that the particle lies in the range $0.490L \le x \le 0.510L$.	5		
5.	(a) Explain the behavior of the classical and quantum particles at a potential barrier with diagrams. Write the expressions for wavefunctions and wave equations for three regions ($x<0$, $0\le x\le L$ & $x>L$). (b) How to classify the nanomaterials based on dimensions? Describe with necessary diagrams.	10	CO3	BL3

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