REG.NO.: 24BCT0234

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

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

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 : 20-03-2025, 2.00 – 3.30 PM
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)
  CO 3: Apply quantum mechanical ideas to microscopic systems

Q. No	Question	M	CO	BL
1.	How do the matter waves differ from electromagnetic waves? Explain an experiment which proves the existence of matter waves with proper diagram and result analysis.	10	3	BL2
2.	a) Consider a Black-body radiation spectrum. Explain the frequency ranges in which Planck's radiation law matches Wiens's exponential and Rayleigh-Jeans law.	5	3	BL3
	b) By applying uncertainty principle, prove that the energy of the confined particle can't be zero.	5		
3.	a) A bullet of mass 0.03 kg is moving with a velocity of 500 m s^{-1}. The speed is measured up to an accuracy of 0.02%. Calculate and comment on its position uncertainty.	5	3	BL3
	b) Consider an electron having kinetic energy of 20 eV. Calculate the wavelength associated with it.	5		
4.	a) A particle in an infinitely deep square well has a wave function given by $\Psi=A\cos(n\pi x/L)$ for $-L/4 \leq x \geq L/4$. Determine the normalization constant A for its first excited state.	5	3	BL3
	b) An electron is confined in an infinite potential box of length 2 Å. Calculate the energy difference between the eighth and sixth excited states.	5		
5.	With short note on quantum tunnelling, schematically represent the wavefunctions on three different regions of a potential barrier. Explain the construction and working principle of microscope that works on the principle of quantum tunnelling.	10	3	BL2

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