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

Continuous Assessment Test (CAT - II), May 2022

Programme	:	**B.Tech**	Semester	:	**Winter 2021-22**
Course Title	:	**Engineering Physics**	Course Code	:	**BPHY101L**
School	:	**School of Advanced Sciences**	Slot	:	**A1**
Duration	:	**90 mins**	Max. Marks	:	**50**
Class No	:				

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks	CO	BL
1	What are the reasons considered by de Broglie to propose his hypothesis? Do electrons have wave nature? Justify your answer with supporting experiment. Key: reasons 3 M. Electron wave 1M, exp 6M.	**10**	**CO2**	
2	Give short notes on Ψ.Introduce the wave mechanical concept and obtain Schrodinger equation when the potential is not dependent on time. Key: properties of Ψ 3 M. Schrodinger eqn 7 M.	**10**	**CO2**	
3	i.Explain why Compton effect is observed for X-rays and gamma rays. 5M ii.Show that the spread of velocities caused by Heisenberg Uncertainty principle does not have measurable consequences for a 100 g ball confined to a room of 15 m on a side. Assume the ball is moving at 2m/s along the x direction. 5M. **key: $\Delta p_x = 3.5x10^{-36}$kgm/s. So $\Delta v_x=3.5x10^{-35}$m/s, $\Delta v/v = 1.8x10^{-35}$ which is not measurable.**	**10**	**CO2**	
4	Examine the following statements: I)i.Nanomaterials can be used in the place of copper wire to carry high currents. ii.Nanomaterials will play a significant role as biomedical implants **Key: High electrical and thermal cond.** **Improved mech prop.Nanomaterials have the reqd properties of a biomedical implant like strength, elastic moduli, ductility, electrical cond,increased surface roughness. Cells in our body are accustomed too interact with**	**10**	**CO2**	

	nanostructured surfaces. **6M** II).A particle in a 1D box has potential energy $V=2a^2\hbar^2x^2/m$ and $\Psi(x)=bxexp(-ax^2)$, where a and b are constants. Find particle energy. 4M **key: Using Ψ find out $d^2\Psi/dx^2$ and substitute in Schrodinger eqn, we get $E= 3a\hbar^2/m$**			
5	For a particle in a box**,** apply Schrodinger equation to evaluate the eigen values, eigen functions, probability of locating the particle in different energy states with necessary diagrams. **Key: expression for energy, soln for Sch eqn in terms of Ψ and Ψ^2 with diagrammatic representation for energy, Ψ, Ψ^2 .**	**10**	**CO2**	