Vidyavardhini's College of Engineering and Technology, Vasai (West)

First Year Engineering

Academic Year: 2024-2025

Assignment No: 04

Subject: BSC102/AP **Date: 18/11/2024**
Max Marks: 10 **Duration: 1 Hr**

CO4: Learners will be able to relate the foundation of quantum mechanics with the development of modern technology.

Q. No.	Questions	Marks	CO	CL
1	Explain de-Broglie hypothesis of matter waves and deduce the expression for wavelength.	**3**	**4**	**2**
2	Calculate de Broglie wavelength of an electron accelerated under the potential of 100 V0lts.	**2**	**4**	**3**
3	State and explain Heisenberg's Uncertainty Principle.	**3**	**4**	**2**
4	Calculate the uncertainty in the position of electron, if the speed of an electron is measured to be 4 x 10^5 m/s to an accuracy of 0.002%.	**2**	**4**	**3**

De Broglie Hypothesis of Matter Waves: *While we don't see waves for large objects like a ball due to their extremely small wavelengths, the concept is crucial for understanding technologies like electron microscopes. These microscopes use the wave nature of electrons (short wavelengths) to resolve tiny structures much smaller than visible light can, enabling advancements in materials science and biology.*

Heisenberg's Uncertainty Principle: *This principle is foundational to quantum mechanics and explains why electrons in atoms don't crash into the nucleus—they exist in probabilistic clouds. On a macroscopic level, it relates to precision limits in measurements. For example, in GPS technology, uncertainties in time measurements (using atomic clocks) can lead to slight deviations in location accuracy, which engineers minimize but can't completely eliminate.*