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

**Continuous Assessment Test (CAT - II), October 2023**

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| Programme | : | B.Tech | Semester | : | Fall 2023-2024 |
| Course Title | : | Engineering Physics | Course Code | : | BPHY101L |
| School | : | School of Advanced Sciences | Slot | : | C2+TC2 |
| Duration | : | 90 mins | Max. Marks | : | 50 |
| Class No | : | 5776, 5780, 5784, 5788, 6676, 6682 | | | |

**Part – A (5 x 10 = 50)**

**Answer ALL Questions**

| Sl. No | Questions | Max Marks | CO |
|---|---|---|---|
| 1 | Explain Planck's Hypothesis. Deduce the Wien's formula and Rayleigh Jean's Law from the Planck's radiation formula. | 10 | CO2 |
| 2 | a) Describe the experiment which proves the wave nature of electron with a suitable schematic diagram. | 5 | CO2 |
| | b) An electron is accelerated by an electric potential of 10 kV. Calculate its momentum and corresponding de Broglie wavelength. | 5 | |
| 3 | a) What were the major observations and outcomes of the Compton scattering experiment? Plot relative intensity as a function of wavelength for three different scattering angles ($0^o$, $45^o$, $90^o$, $135^o$). How do you account for the unmodified peak in this plot? | 5 | CO2 |
| | b) If the position of an electron in an atom is measured to an accuracy of 0.01 nm, what is the electron's uncertainty in its velocity? Then, if the electron has this velocity, calculate its kinetic energy in eV. | 5 | |
| 4 | A particle of mass m is bound in an infinite potential box of length L. Show that the energy of the particle is quantized and they are inversely proportional to $L^2$. Further, compute the normalized wave functions of the quantized state. | 10 | CO3 |
| 5 | a) What is quantum confinement? Classify nanomaterials based on quantum confinement with suitable examples. | 5 | CO3 |
| | b) An electron is confined in a potential box of length L. When the electron jumps from the first excited state to the ground state, it emits radiation of wavelength 600 nm. Then, calculate L. | 5 | |