VIT

Vellore Institute of Technology

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

Continuous Assessment Test (CAT - II), April 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-2024
Course Title	:	Engineering Physics	Course Code	:	BPHY101L
School	:	School of Advanced Sciences	Slot	:	D1+TD1
Duration	:	90 mins	Max. Marks	:	50
Course Instructors & Class No	:	Mounika Gosika (1891), Anuradha C (1892), Tulsi Anna (1893), Kanhaiya Lal Pandey (1894), Atul Thakre (1895), Kuraganti Vasu (1896), Sridhar S (1897), Dhanoj Gupta (1899), Suresh Kumar Vandrangi (1900), Tarun (1901), Murali R (1902), Bhaskar Sen Gupta (4393).			

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks
1	For decades, the Cathode Ray Tube was used for video displays from televisions to computer screens where the electrons were regarded as a particle. Explain in detail, with neat diagrams, the experiment that provided the very first evidence of wave nature of electrons	10
2	(a) The flame of a candle has a yellowish colour and the flame of a Bunsen's burner in the laboratory has a bluish colour. Find out which flame has a higher temperature? Describe how the intensity spectrum of radiation emitted from a colder object differs from the hotter object (b) X-rays with wavelength of 71-pm is incident on a calcite target. Find the wavelength of the X-rays scattered at the angle of 30°. What is the maximum shift that can be expected in this experiment?	5 5
3	(a) Arrive at wave equation that describes the energy and position of the electron in space and time, taking into the account the wave nature of a moving electron. (b) Determine the minimum uncertainties in the positions of the following objects if their speeds are known with a precision of 1.0×10^{-3} m/s (i) an electron and (ii) a bowling ball of mass 6.0 kg.	5 5
4	A perfectly elastic ball is constrained to move along a straight line inside a tube of length L. Due to some block at $3/4^{th}$ L the ball could not move beyond that point. Derive the Eigen values and Eigen function for the ball.	10
5	(a) Emission colors of CdSe quantum dots vary with size. Smaller particles emit blue light and increase in particle size leads towards red colour. Explain the physics behind it. Further comment on the consequences of size reduction. (b) An electron with kinetic energy 9.00 eV is incident on a square potential barrier with height of 10.00 eV and width of 5 nm. Find its transmission probability. If a proton is to have the same energy and transmission probability as an electron, what must the width of the barrier for proton be relative to the barrier width encountered by an electron?	5 5