



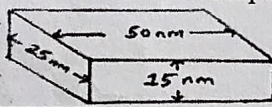
Continuous Assessment Test (CAT) – II March 2025

Programme	: B.Tech.	Semester	: Winter Semester 2024-25
Course Code & Course Title	: Engineering Physics	Slot	: F1+TF1
Faculty	: Dr. G. Vinitha, Dr. N. Manikandan Dr. R. D. Eithiraj, Dr. N. Punithavelan Dr. Caroline Ponraj, Dr. B. Ajitha Dr. S. Karthikeyan, Dr. M. C. Ramkumar Dr. M. G. Shalini, Dr. A. Kalaipriya Prof. P. Swathi	Class Number	: CH2024250500278, CH2024250500282 CH2024250500286, CH2024250500290 CH2024250500296, CH2024250500310 CH2024250500320, CH2024250500304 CH2024250500314, CH2024250500316 CH2024250500300
Duration	: 1½ Hours	Max. Mark	: 50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

Answer ALL FIVE Questions (5 x 10 = 50)

Q. No	Sub Sec.	Description	CO	BT	Marks
1	a	Incident photons of energy 10.39 keV are Compton scattered, and the scattered beam is observed at 45° relative to the incident beam. What is the energy of the scattered photons at that angle? What is the kinetic energy of the scattered electrons?	2	K1	7
	b	An atom in an excited state temporarily stores energy. If the lifetime of this excited state is measured to be 1.0×10^{-10} s, what is the minimum uncertainty in the energy of the state in eV?	2	K1	3
2	a	An electron having total kinetic energy E of 4.50 eV approaches a rectangular energy barrier with $V = 5.00$ eV and $L = 950$ pm. Classically, the electron cannot pass through the barrier because $E < V$. Calculate probability of tunnelling of this electron through the barrier.	3	K2	5
	b	What is the surface-area-to-volume ratio of the nanoparticle in the diagram? 	3	K2	5
3	a	(i) Calculate the coherence length of a laser beam for which the band width $\Delta\nu = 3000$ Hz. (ii) A hypothetical atom has energy levels uniformly separated by 1.2 eV. At a temperature 2000 K, what is the ratio of the number of atoms in the 13 th excited state to the number in the 11 th excited state?	4	K2	3+4
	b	Is LASER a good example for quantum phenomenon or classical? Justify your answer.	4	K6	3
4		Consider the wave function given by $\Psi(x) = B e^{inx}$ where $0 \leq x \leq 2\pi$. Determine the value of B such that the following wave function is normalised from 0 to 2π . 1. Calculate Ψ^* (depending on whether Ψ is real or imaginary). 2. Apply normalization condition and calculate the value of B. 3. Write the final Normalised wave function.	3	K5	10
5		(i) In Davisson-Germer experiment, an electron beam of energy 74 eV is incident normally on a crystal surface. What is the inter-planar spacing in the crystal lattice if the maxima of order 1 is obtained at an angle of 45° to incident direction? (ii) Can an amorphous material be used in Davisson-Germer experiment? Justify your answer with proper reasoning. (iii) A nonrelativistic particle is moving three times as fast as an electron. The ratio of their de Broglie wavelength's, particle to electron is 1.813×10^{-4} . Identify the particle.	2	K1	4+3+3

***** All the best *****