



VIT

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

Continuous Assessment Test (CAT - II), October 2023

Programme	: Int. MTech	Semester	: Fall 2023-2024
Course Title	: Engineering Physics	Course Code	: IPHY101L
School	: School of Advanced Sciences	Slot	: E2+TE2
Duration	: 90 mins	Max. Marks	: 50
Class No	: 6073, 5840, 5834, 5896, 7943		

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks
1	Write the Planck's radiation relation in terms of wavelength and draw the black body radiation spectrum for any three different temperatures. Deduce Wein's radiation law and Rayleigh-Jeans law using proper limits in Planck's radiation formula.	10
2	(a) Write de-Broglie statement. We consider a charged particle which is accelerated in electric potential "V". Show that the wavelength of the de-Broglie wave produced by the charged particle is inversely proportional to the square root of "V" (b) When does recoil electron attain maximum kinetic energy in Compton scattering experiment? Calculate (i) energy of incident photon (ii) wavelength of scattered photon at above mentioned condition and (iii) energy of scattered photon. The wavelength of incident photon is 1.22 nm.	5
3	(a) Write the one-dimensional time dependent Schrodinger wave equation. Obtain time independent wave equation from the above equation with proper assumption. (b) We consider the electron is one of the constituents of the nucleus. Assume that the uncertainty location of the nucleus is $2r_0 = 2 \times 10^{-14} \text{ m}$. How do you prove the electron does not a constitution of the nucleus.	5
4	What is free particle. Discuss the potential energy and boundary conditions of free particle trapped in a box of width "L" with proper diagram. Write the mathematical model equation of this system and show that the energy of the trapped particle is inversely proportional to the L^2 .	10
5	(a) Define tunnelling effect. Mention any one device which is working based on the principle of tunneling effect. Explain the working principle of mentioned device with neat diagram. (b) The proton is trapped in infinite potential box of width is 3.21nm. Calculate the energy of proton for lowest allowed first three states. Mass of the proton is $1.6726 \times 10^{-27} \text{ kg}$.	5