

MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

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Sessional Examination I: ODD Semester 2024-25

Course/Branch	: B Tech	Semester	: I
Subject Name	: Engg. Physics	Max. Marks	: 60
Subject Code	: BAS101	Time	: 120 min
Sections	: OP1--- OP14		

CO-1 : Understand the concepts of quantum mechanics

CO-2 : Derive the expression for EM-wave using Maxwell's equations

Section - A (CO - 1) # Attempt both the questions # 30 Marks

- Q.1 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)
- Write down the limitation of Rayleigh-Jeans law. (K2)
 - Explain the modified and unmodified radiations in Compton scattering. (K2)
 - Explain why Compton shift is not observed with visible light. (K3)
 - Describe the differences between electromagnetic and matter wave. (K2)
 - What do you mean by wave particle duality? (K2)
 - Write the objective and conclusion of conducting Davisson and Germer experiment. (1+1) (K2)
 - Explain the physical significance of wave function. (K2)

- Q.2 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)
- Derive time Independent Schrodinger wave equation. (K3)
 - Solve Schrodinger equation for a particle in a one -dimensional box and show that energy eigen values are discrete. (4+2) (K3)
 - Determine the probability of finding a particle trapped in a box of length L in the region from $0.45L$ to $0.55L$ for the ground state. (K3)
 - X-rays of Wavelength 2 \AA are Scattered from a black body and x-rays are scattered at an angle of 45° . Calculate Compton shift, wavelength of scattered photon λ' . (K3)
 - Define phase velocity and group velocity and also establish a relation between them for dispersive medium. (1+1+4) (K2)

Section - B (CO - 2) # Attempt both the questions # 30 Marks

- Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)
- Write the applications of EM waves in daily life. (K2)
 - Discuss Faraday's law for electromagnetic induction. (K2)
 - Derive equation of continuity from Maxwell's equation. (K2)
 - Show that magnetic monopoles do not exist. (K3)
 - Write down the statement of Stoke's theorem and Gauss Divergence theorem. (1+1) (K2)
 - Describe the differences between conduction and displacement current. (K2)

- Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)
- Derive Maxwell's equations in differential form. Give physical significance of each equation. (4+2) (K2)
 - Deduce Coulomb's law of electrostatics from Maxwell's first equation. (K2)
 - Derive the equation for the propagation of plane electromagnetic wave in free space. Show that the velocity of plane electromagnetic wave in free space is given by $c = 1/\sqrt{\mu_0 \epsilon_0}$. (4+2) (K3)
 - Prove that electromagnetic waves are transverse in nature. (K3)
 - Why Maxwell proposed that Ampere law require modification? Derive the necessary expression for it. (2+4) (K3)