CBCS SCHEME

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BPHYS102/202

First / Second Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Applied Physics for CSE Stream

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. VTU Handbook is permitted.

		Module – 1	M	L	C
Q.1	a.	Obtain the expression for energy density equation using Einstein's coefficients at thermal equilibrium condition.	9	L2	CO1
	b.	Discuss the types of optical fibers based on modes of Propagation and Refractive Index profile.	6	L2	CO1
	c.	Given the numerical aperture 0.30 and RI f core 1.49. Calculate the critical angle for the core – cladding interface.	5	L3	CO1
		OR			
Q.2	a.	Illustrate the construction and working of semiconductor laser with a neat sketch with energy level diagram.	8	L2	CO1
	b.	Define Acceptance angle and Numerical aperture and hence derive an expression for Numerical aperture in terms of Refractive Indices of core, cladding and surrounding.	7	L2	CO1
	c.	In an optical fiber experiment the LASER light propagating through optical fibre cable of 1.5m , made a spot diameter of 8mm on the screen. The distance between the end of the optical fibre cable and the screen is 0.031m. Calculate angle of contact and N.A of given optical fibre.	5	L3	CO5
		Module – 2			
Q.3	a.	Derive an expression for de Broglie wavelength by analogy and hence discuss the significance of de Broglie waves.	6	L2	CO2
	b.	Set – up Schrodinger time independent wave equation in one dimension.	9	L2	CO2
	c.	Calculate the energy of the first three energy states for an electron in one dimensional potential well of width 0.1nm.	5	L3	CO2
		OR			
Q.4	a.	State and explain Heisenberg's uncertainty principle and show that electron does not exist inside the nuclear using Heisenberg's uncertainty principle.	7	L2	CO2
	b.	Explain Eigen values and Eigen functions and hence derive the Eigen function of a particle inside infinite potential well of width 'a' using the method of Normalization.	8	L2	CO2

	c.	The kinetic energy of an electron is equal to the energy of a photon with a wave length of 560 nm. Calculate the de Broglie wave length of the electron.	5	L3	CO2
		Module – 3			
Q.5	a.	State the Pauli matrices and apply Pauli matrices on the states $\|0>$ and $\|1>$.	9	L2	CO2
	b.	Discuss the CNOT gate and its operation on four different input states.	6	L2	CO2
	c.	Given $\|\Psi>=\begin{pmatrix}\alpha_1\\ \alpha_2\end{pmatrix}$ and $\|\phi>=\begin{pmatrix}\beta_1\\ \beta_2\end{pmatrix}$, Prove that $<\Psi\|\phi>=<\phi\|\Psi>^*$.	5	L3	CO2
		OR			
Q.6	a.	Explain the representation of qubit using Block sphere.	7	L2	CO3
	b.	Describe the working of controlled – Z gate mentioning its matrix representation and truth table.	8	L3	CO3
	c.	A linear operator 'X' operates such that $X\|0>=\|1>$ and $X\|1>=\|0>$. Find the matrix representation of 'X'.	5	L3	CO3
		Module – 4			
Q.7	a.	Enumerate the assumptions of Quantum free electron theory of metals and mention the failures and classical free electron theory.	7	L2	CO3
	b.	Describe Meissner effect and hence classify superconductors into Soft and Hard super conductors using M – H graphs.	8	L2	CO3
	c.	Calculate the probability of occupation of an energy level 0.2ev above Fermi level at temperature 27°C.	5	L3	CO3
		OR			
Q.8	a.	Define Fermi factor and discuss the variation of Fermi factor with temperature and energy.	7	L2	CO3
	b.	Explain the phenomenon of superconductivity and discuss qualitatively the BCS theory of super conductivity for negligible resistance of metal at temperature close to absolute zero.	8	L2	CO3
	c.	A superconductivity Tin has a critical temperature of 3.7K at zero magnetic field and a critical field of 0.0306 Tesla at 0°K. Find the critical field at 2K.	5	L3	CO3
		Module – 5			
Q.9	a.	Elucidate the importance of size and scale , weight and strength in animations.	8	L2	CO4
	b.	Discuss the salient features of normal distribution using bell curves.	7	L2	CO4

	c.	A slowing object in an animations has a first frame distance 0.5m and the first slow in frame 0.35m. Calculate the base distance and the number of frames in sequence.	5	L3	CO4
		OR			
Q.10	a.	Describe Jumping and parts of Jump.	8	L2	CO4
	b.	Discuss modeling the probability for proton decay.	7	L2	CO4
	c.	In a diffraction grating experiment the laser light undergoes second order diffraction for diffraction angle 1.48°. The grating constant $d = 5.05 \times 10^{-5}$m and the distance between the grating and screen is 0.60m. Find the wavelength of LASER light.	5	L3	CO5

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