Q. 05	**a.**	Describe the operations of the Phase gate (S–gate) and show that the S-gate can be formed by connecting two T–gates in series.	**09**	**3**	**L4**
	b.	Describe the working of the Controlled NOT gate and mention its matrix representation and truth table	**07**	**2**	**L3**
	c.	Find the probability that we find in the qubit in the state |0> and |1>, **i.** $\|\psi>=\frac{1}{\sqrt{3}}\|0>+\sqrt{\frac{2}{3}}\ \|1>$ **ii.** $\|\psi>=\frac{i}{2}\|0>+\frac{\sqrt{3}}{2}\ \|1>$	**04**	**2**	**L3**
		OR			
Q. 06	**a.**	Visualize the Qubit state $\|\psi>$ on a 3D Bloch sphere by determining the appropriate polar angle (Θ) and azimuthal angle (φ)	**09**	**3**	**L4**
	b.	Explain the Pauli matrices and apply Pauli matrices in the state |0> and |1>	**07**	**2**	**L3**
	c.	Consider the following two kets $\|\psi>=\begin{pmatrix}-3i\\8i\\1\end{pmatrix}$ and $\|\phi>=\begin{pmatrix}1\\0\\5i\end{pmatrix}$. i. Find $\|\psi>^*$ and $\|\phi>^*$ ii. Are $\|\psi>$ and $\|\phi>$ orthogonal?	**04**	**2**	**L3**
		Module -4			
Q. 07	**a.**	Based on the DC Josephson effect, explain the construction and working of DC SQUID with a neat diagram.	**08**	**3**	**L4**
	b.	Describe the Fermi factor based on the variation of energy value and temperature, and analyze their occupancy with a neat diagram.	**08**	**2**	**L3**
	c.	The superconducting transition temperature of Lead is 7.26K. Calculate the critical magnetic field at 0K given the critical Field at 5K is 33.644×10^3 A/m.	**04**	**2**	**L3**
		OR			
Q. 08	**a.**	Verify the failures of the classical free electron theory of different metals in explaining electrical conductivity dependence on temperature and electron concentration.	**08**	**3**	**L4**
	b.	Explain Meissner's Effect also discuss the variation of the critical magnetic field with the temperature of a superconductor.	**08**	**2**	**L3**
	c.	Find the temperature at which there is a 1% probability that a state with energy 0.05 eVabove Fermi energy is occupied.	**04**	**2**	**L3**
		Module -5			
Q. 09	**a.**	Discuss the salient features of Normal distribution using bell curves.	**06**	**2**	**L3**
	b.	Analyze the odd rule and odd rule scenarios with a suitable example. Given the base distance is 2m for the slow-in-motion. Find the distance covered between frames 2nd and 3rd, 1st and 5th frame.	**10**	**3**	**L4**
	c.	In the case of the Jump action, the push height is 0.4m and the Jump magnification is 5. Calculate the jump height, and push acceleration. Acceleration due to gravity = 9.8 m/s^2.	**04**	**2**	**L3**
		OR			
Q. 10	**a.**	Elucidate the importance of Size & Scale, Weight & Strength in Animation.	**06**	**2**	**L3**
	b.	Estimate the value of Pi by explaining the Monte Carlo method. At a place, a volcanic eruption occurs twice in 100 years. Calculate the probability at K = 0, 1, 2, 3 assuming the Poisson Model and λ=2.	**10**	**3**	**L4**
	c.	While animating speeding up car animation, the total distance covered over 7 frames is 0.18m. Calculate the base distance by using Odd rule Multipliers.	**04**	**2**	**L3**

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Approved by AICTE, New Delhi |Recognized by Govt. of Karnataka|

First Semester B.E Degree Examination, February/March 2024
Applied Physics for CSE Stream

Duration: **3 hrs** Max. Marks: **100**

Note: *1. Answer five full questions choosing one complete question from each module.*
2. Formula Hand Book is permitted
3. M: Marks, L: Bloom's level, C: Course outcomes.

Constants: Speed of Light 'c' = 3×10^8 ms^{-1}, Boltzmann Constant 'k' = 1.38×10^{-23} JK^{-1}, Planck's Constant 'h' = 6.626×10^{-34}Js, Acceleration due to gravity 'g'= 9.8 ms^{-2},Permittivity of free space (ε_0) =8.854×10^{-12} Fm^{-1}

		Questions	M	CO	L
		Module -1			
Q. 01	a.	Deduce the expression for the energy density of radiation at thermal equilibrium in terms of Einstein's coefficients and thus conclude on B_{12}= B_{21}.	08	3	L4
	b.	Discuss the application of LASER in the laser Printer and Laser Cooling.	08	2	L3
	c.	A medium in thermal equilibrium at a temperature of 330 K has two energy levels with a wavelength separation of 2 μm. Find the ratio of population densities of upper and lower energy states.	04	2	L3
		OR			
Q. 02	a.	Study the construction and working of Semiconductor LASER with a neat sketch and energy level diagram to produce LASER of wavelength nearly 887 nm.(E_g=1.4 eV)	08	3	L4
	b.	Describe attenuation and explain the various fiber losses.	08	2	L3
	c.	The angle of acceptance of an optical fiber is 30° when kept in the air. Find the angle of acceptance when it is in a medium of refractive index 1.33.	04	2	L3
		Module -2			
Q. 03	a.	Setup time independent Schrodinger wave equation for a free particle in one dimension.	09	2	L3
	b.	Discuss the wave function and its physical significance in explaining the concept of matter waves.	06	2	L3
	c.	An electron is bound in a one-dimensional potential well of width 10 nm of infinite height. Find its energy values in eV in the ground state and the first two excited states.	05	2	L3
		OR			
Q. 04	a.	Assuming time independent Schrodinger wave equation, obtain expression for Eigen energy and Eigen function for a particle in an one dimensional infinite potential well. Also,derive the expression for the normalized wave function.	09	2	L3
	b.	Using Heisenberg's uncertainty principle show that an electron does not exist inside the nucleus.	06	2	L3
	c.	An electron is associated with a de-Broglie wavelength of 8 nm. Calculate the energy of the electron in eV and also calculate its momentum.	05	2	L3
		Module -3			