		one-dimensional infinite potential well. Also, derive the expression for the normalized wave function.			
	c.	The ground state energy of an electron in an infinite potential well is 5.6 meV. If the width of the wall is doubled what is its ground state energy?	05	2	L3
		Module -3			
Q. 05	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.	Describe the working of the CNOT 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. $\|\psi>=\frac{1+i}{\sqrt{3}}\|0>-\frac{i}{\sqrt{3}}\|1>$ ii) $\|\psi>=\frac{i}{2}\|0>+\frac{\sqrt{3}}{2}\|1>$	04	2	L3
		OR			
Q. 06	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.	Explain the Pauli matrices and apply Pauli matrices on the states, $\|0>$ and $\|1>$.	07	2	L3
	c.	Show that the matrix $U=\frac{1}{\sqrt{5}}\begin{pmatrix} i & -2i \\ -2i & -i \end{pmatrix}$ is Unitary.	04	2	L3
		Module -4			
Q. 07	a.	With a neat M-H curve distinguish between Type I and Type II superconductors based on the Messiner effect and critical Magnetic field. Also, mention examples and applications.	08	3	L4
	b.	Discuss the success of quantum free electron theory.	07	3	L3
	c.	Calculate the probability of an electron occupying an energy level of 0.02 eV above the Fermi level at 300 K and 400 K.	05	2	L3
		OR			
Q. 08	a.	Evaluate the Fermi factor based on the variation of energy value and temperature, and analyze their occupancy with a neat diagram.	08	3	L4
	b.	Explain Meissner's Effect alos discuss the variation of the critical magnetic field with the temperature of a superconductor.	07	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.	05	2	L3
		Module -5			
Q. 09	a.	Describe Jumping and explain the different parts of jumping with a suitable example.	08	2	L3
	b.	Estimate the value of Pi by explaining the Monte Carlo method.	07	3	L4
	c.	The number of particles emitted randomly by a radioactive sample obeys the Poisson distribution with $\lambda=3$. Calculate p(x=0), P (x =1), P(x =2),P(x=3).	05	2	L3
		OR			
Q. 10	a.	Describe the importance of Size and Scale, Weight and Strength in animations with examples.	08	2	L3
	b.	Analyze the modelling probability for proton decay.	07	3	L4
	c.	Given the base distance is 3m for the slow-in-motion. Find the distance covered between frames 2nd and 3rdas well as between 1st and 5th frames. Respresent the corresponding odd rule multiplier table.	05	2	L3

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BPHYS102

Maharaja Education Trust (R), Mysuru

MAHARAJA INSTITUTE OF TECHNOLOGY MYSORE

An Autonomous Institute, affiliated Visvesvaraya Technological University, Belagavi

Belawadi, Srirangapatna Taluk, Mandya – 571 477

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.

Note:	01. Answer any **FIVE** full questions, choosing at least **ONE complete** question from each **MODULE**. 02. Draw neat sketches wherever necessary 03. **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	Marks	CO	L
		Module -1			
Q. 01	**a.**	Deduce the expression for the energy density of radiation in terms of Einstein coefficients at thermal equilibrium conditions and thus conclude on $B_{12}= B_{21}$.	**08**	**3**	**L4**
	b.	Discuss the application of optical fiber in point-to-point communication systems with a neat block diagram. Also, mention its two applications.	**08**	**2**	**L3**
	c.	Calculate the attenuation coefficient of the given optical fiber of length 500 m, given the input and output power values are 100 mW and 90mW respectively.	**04**	**2**	**L3**
		OR			
Q. 02	**a.**	With a neat diagram compute the expression for the numerical aperture of an optical fibre using the core, cladding, and surrounding refractive indices and study the condition of propagation of signal through it.	**08**	**3**	**L4**
	b.	Write a brief note on how the laser cooling system and bar code reader operates.	**08**	**2**	**L3**
	c.	The average output power of a laser source emitting a laser beam of wavelength 692.8 nm is 8mW, hence evaluate the number of photons emitted per second by the laser source.	**04**	**2**	**L3**
		Module -2			
Q. 03	**a.**	Discuss the wave function and its physical significance in explaining the concept of matter waves.	**06**	**2**	**L3**
	b.	Setup time independent Schrodinger wave equation for a particle in one dimension.	**09**	**2**	**L3**
	c.	An electron has a speed of 100 m/s, the uncertainty measured in the speed is 0.05%. Find the corresponding uncertainty in its position.	**05**	**2**	**L3**
		OR			
Q. 04	**a.**	Using Heisenberg's uncertainty principle show that an electron does not exist inside the nucleus.	**06**	**2**	**L3**
	b.	Assuming time independent Schrodinger wave equation, obtain expression for Eigen energy and Eigen function for a particle in an	**09**	**2**	**L3**