CBCS SCHEME

USN 4 V P

BPHYS102/BPHYS202

First/Second Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
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. *Draw neat sketches where ever necessary.*
3. *VTU Formula Hand Book is permitted.*
4. *M : Marks , L: Bloom's level , C: Course outcomes.*
5. *Constants: Speed of Light $C = 3 \times 10^8$ m/s, Boltzmam const. $K = 1.38\times10^{-23}$ J/K^{-1}, Planck's const $h = 6.625 \times 10^{-34}$ JS, Acceleration due to gravity $g = 9.8 m/s^{-2}$, Permittivity of Free space $\epsilon_0 = 8.854\times10^{-12}$ Fm^{-1}*

		Module – 1	M	L	C
Q.1	a.	Define LASER and explain the interaction of radiation with matter for the induced absorption, spontaneous emission and stimulated emission.	7	L1	CO1
	b.	Discuss different types optical fibers based on modes of propagation and refractive index profile.	9	L2	CO1
	c.	Find attenuation in an optical fiber of length 500m, when a light signal of power 100mW emerges out of the fiber with a power of 90mW.	4	L3	CO1
		OR			
Q.2	a.	Obtain the expression for energy density of radiation using Einstein's co-efficient A and B and thus conclude $B_{12} = B_{21}$.	9	L2	CO1
	b.	Discuss point to point communication using optical fiber.	6	L2	CO1
	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 source is 0.60m, find the wavelength of LASER light.	5	L3	CO5
		Module – 2			
Q.3	a.	State and explain Heisenberg's uncertainty principle. Using the principle show that electron doesn't exist inside the nucleus.	7	L2	CO2
	b.	Set up Schrodinger's time independent wave equation in one dimension.	8	L2	CO2
	c.	A particle of mass 0.5 MeV/C^2 has kinetic energy 100 eV. Find its de-Broglie wavelength where 'C' is the velocity of light.	5	L3	CO2
		OR			
Q.4	a.	Find the Eigen values and Eigen functions for a particle in one dimensional infinite potential well.	9	L2	CO2
	b.	Discuss de-Broglie hypothesis.	6	L2	CO2
	c.	Calculate the energy of the first three states for an electron in one dimensional potential well of width 1A°.	5	L3	CO2

		Module – 3			
Q.5	**a.**	Explain the representation of qubit using Bloch sphere.	6	L2	CO2
	b.	Discuss CNOT gate, matrix representation and its operation on four different input states.	6	L2	CO2
	c.	A linear operator X operates such that $X\|0\rangle = \|1\rangle$ and $X\|1\rangle = \|0\rangle$. Find the matrix representation of X	8	L3	CO2
		OR			
Q.6	**a.**	State the Pauli's metrics and apply Pauli matrices on the states $\|0\rangle$ and $\|1\rangle$ states.	8	L3	CO2
	b.	Elucidate the differences between classical and quantum computing.	6	L2	CO2
	c.	Explain matrix representation of 0 and 1 states and apply identify operator I to $\|0\rangle$ and $\|1\rangle$ states.	6	L3	CO2
		Module – 4			
Q.7	**a.**	Enumerate the failures of Classical Free Electron [CFET] Theory and mention the assumptions of Quantum Free Electron Theory [QFET]	7	L2	CO3
	b.	Describe Meissner's effect. Distinguish between Type I and Type II super conductors.	8	L2	CO3
	c.	Lead has a superconducting transition temperature of 7.26K. If initial field at 0K is $50 \times 10^3 Am^{-1}$, calculate the critical field at 6K.	5	L3	CO3
		OR			
Q.8	**a.**	Define Fermi factor. Discuss the variation of Fermi factor with temperature and energy.	7	L2	CO3
	b.	Explain the phenomenon of super conductivity. Discuss qualitatively BCS theory of super conductivity.	8	L2	CO3
	c.	Calculate the probability of occupation of an energy level 0.02eV above Fermi level at temperature 200K.	5	L3	CO3
		Module – 5			
Q.9	**a.**	Discuss timing in linear motion, uniform motion, slow in and slow out.	8	L2	CO4
	b.	Enumerate the difference between inferential and descriptive statistics.	6	L2	CO4
	c.	In an optical fiber experiment, the light passing through the fiber, made a spot diameter of 8mm on the screen. The distance between the end of the optical fiber cable and the screen is 0.031m. Calculate the angle of acceptance and numerical aperture of given optical fiber.	6	L3	CO5
		OR			
Q.10	**a.**	Describe Jumping and parts of Jump.	8	L2	CO4
	b.	Discuss the salient features of Normal distribution using Bell curves.	7	L2	CO4
	c.	While animating speeding up car animation, the total distance covered over 6 frames is 25m. Calculate the base distance.	5	L3	CO4

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