CBCS SCHEME

USN

BPHYS102/202

First/Second Semester B.E./B.Tech. Degree Examination, June/July2023
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. ***VTU Formula Hand Book is permitted.***
3. ***M : Marks , L: Bloom's level , C: Course outcomes.***
4. ***Constants : Speed of Light C = 3 × 10^8 m/s, Boltzmam const. K = 1.38×10^{-23} J/K, Planck's const h = 6.625 × 10^{-34} JS, Acceleration due to gravity g = 9.8m/s^2, mass of electron m = 9.1 × 10^{-31} Kg***

		Module – 1	M	L	C
Q.1	a.	Derive an expression for energy density interms of Einstein's coefficients in Laser action.	10	L2	CO1
	b.	Explain types of optical fibers.	6	L2	CO1
	c.	The ratio of population inversion of two energy levels is 1.059 × 10^{-30}. Find the wavelength of Light emitted by spontaneous emissions at 330K.	4	L3	CO1
		OR			
Q.2	a.	Derive an expression for Numerical aperture in an optical fiber.	8	L2	CO1
	b.	Discuss construction and working of semiconductor diode Laser with energy level diagram.	8	L2	CO1
	c.	The angle of acceptance of an optical fiber is 30°, when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33.	4	L3	CO1
		Module – 2			
Q.3	a.	What is wave packet? Give physical significance and properties of wave function? Define group velocity.	8	L2	CO1
	b.	State and explain Heisenberg's uncertainty principle. Give its physical significance. Show that electron cannot exist inside the nucleus.	8	L2	CO2
	c.	A particle of mass 0.5meV/c^2 has kinetic energy 100eV. Find its de Broglie wavelength, where 'C' is the velocity of light.	4	L3	CO2
		OR			
Q.4	a.	Derive an expression for Schrödinger's Time independent equation one dimensional form.	8	L2	CO2
	b.	Obtain the expression for energy eigen values using Schrodinger's time independent equation.	8	L2	CO2
	c.	In a measurement of position and velocity of an electron moving with a speed of 6 × 10^5 m/s, calculate highest accuracy with which its position could be determined, if the inherent error in the measurement of its velocity is 0.01% for the speed stated.	4	L3	CO2

		Module – 3			
Q.5	**a.**	Explain single qubit gate and multiple qubit gate with example for each.	**8**	**L2**	**CO2**
	b.	Discuss CNOT gate and its operation on four different input states.	**8**	**L2**	**CO2**
	c.	Given $A = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$ prove that $A^{+} = A$.	**4**	**L3**	**CO2**
		OR			
Q.6	**a.**	Elucidate the differences between classical computing and Quantum computing.	**8**	**L2**	**CO2**
	b.	Discuss the working of phase gate mentioning its matrix representation and truth table.	**8**	**L2**	**CO2**
	c.	Find the inner product of states $\|11\rangle$ and $\|10\rangle$ and draw conclusionon the result.	**4**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	Distinguish between Type – I and Type – II super conductors.	**8**	**L2**	**CO3**
	b.	Discuss the effect of temperature and impurity on electrical resistivity of conductors and hence explain for superconductors.	**8**	**L2**	**CO3**
	c.	In a diffraction grating experiment the laser light undergoes second order diffraction, if the distance between screen and grating is 20cm, and average distance of 2^{nd} order spot 2.7cm grating constant 1×10^{-5}m, calculate the wavelength of laser light.	**4**	**L3**	**CO5**
		OR			
Q.8	**a.**	Explain B.C.S theory of superconductivity.	**7**	**L2**	**CO1**
	b.	Define Fermi energy level. Discuss various energy states by the electrons at T = O K and T > O K on the basis of fermifactor.	**8**	**L2**	**CO1**
	c.	Calculate the acceptance angle and numerical aperture of given optical fiber having diameter of spot is 2.6cm and distance between screen and optical fiber 3.0cm.	**5**	**L2**	**CO1**
		Module – 5			
Q.9	**a.**	Elucidate the importance of size and scale and weight and strength in animations.	**8**	**L2**	**CO4**
	b.	Discuss modeling probability of proton decay.	**8**	**L2**	**CO4**
	c.	The number of particles emitted per second by a random radioactive source has a Poisson's distribution with $\lambda = 4$. Calculate the probability of P(X = 0) and P(X = 1)	**4**	**L3**	**CO4**
		OR			
Q.10	**a.**	Discuss timing in Linear motion, uniform motion, show in and flow out.	**8**	**L2**	**CO4**
	b.	Discuss salient features of Normal distribution using Bell curves.	**8**	**L2**	**CO4**
	c.	A slowing in object in an animation has a first frame distance 0.5m and first slow in frame 0.35m. Calculate the base distance and the number of frames in sequence.	**4**	**L3**	**CO4**

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