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CBCS SCHEME

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BPHYS102/202

First/Second Semester B.E/B.Tech. Degree Examination, June/July 2026
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 Formula Hand Book is permitted.

		Module – 1	M	L	C
1	a.	Derive an expression for energy density of incident radiation in terms of Einstein's co-efficient.	8	L2	CO1
	b.	Define Acceptance Angle and Numerical Aperture. Derive an expression for numerical aperture interms of refractive indices of core, cladding and surrounding.	8	L2	CO1
	c.	Obtain the attenuation co-efficient of the given fiber of length 1500 m, when a light signal of power 100 MW emerges out of the fiber with a power of 70 MW.	4	L3	CO1
		OR			
2	a.	Define Population Inversion. Explain the construction and working of a semiconductor laser with the help of energy level diagram.	8	L2	CO1
	b.	Discuss the three different types of optical fibers based on modes of propagation and refractive index profile.	8	L2	CO1
	c.	In a diffraction grating experiment the LASER light undergoes second order diffraction for diffraction angle 51.62°. The grating constant d = 1.69×10^{-6}m and the distance between the grating and the source is 8 cm. Find the wavelength of LASER light.	4	L3	CO1
		Module – 2			
3	a.	Setup Schrodinger time independent wave equation in one dimension.	9	L2	CO2
	b.	State and explain Heisenberg's uncertainty principle. Using the principle show that electron does not exist inside the nucleus.	6	L2	CO2
	c.	An electron is associated with a de-Broglie wavelength of 1 nm. Calculate the energy and the corresponding momentum of the electron.	5	L3	CO2

		OR			
4	a.	Find the Eigen values and Eigen functions for a particle in one dimensional potential well of infinite height.	**9**	**L2**	**CO2**
	b.	Define Phase Velocity and Group velocity. Derive an expression for de-Broglie wavelength by analogy.	**6**	**L2**	**CO2**
	c.	Calculate the energy of the first three states for an electron in one dimensional potential well of width 0.1 nm.	**5**	**L3**	**CO2**
		Module – 3			
5	a.	Explain the Pauli matrices and apply Pauli matrices on the states $\|1\rangle$ and $\|0\rangle$.	**8**	**L2**	**CO2**
	b.	Elucidate the difference between Classical and Quantum Computing.	**6**	**L2**	**CO2**
	c.	Explain the matrix representation of $\|0\rangle$ and $\|1\rangle$ states and apply identity operator I to $\|0\rangle$ and $\|1\rangle$ states.	**6**	**L2**	**CO2**
		OR			
6	a.	Explain single qubit gate and multiple qubit gate with an example for each.	**8**	**L2**	**CO2**
	b.	What is Bloch Sphere? Explain the representation of qubit using Bloch Sphere.	**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'.	**6**	**L2**	**CO2**
		Module – 4			
7	a.	Define Fermi Factor and discuss the variation of Fermi factor with temperature and energy.	**8**	**L2**	**CO3**
	b.	Describe Meissner effect and hence classify super conductors into soft and hard superconductors using M-H graphs.	**7**	**L2**	**CO3**
	c.	A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306T at 0K. Find the critical field at 2K.	**5**	**L3**	**CO3**
		OR			
8	a.	Explain DC and AC Josephson effects. Give the qualitative explanation of RF squid with the help of a diagram.	**8**	**L2**	**CO3**
	b.	Enumerate the failures of Classical free electron theory and assumptions of quantum free electron theory of metals.	**7**	**L2**	**CO3**
	c.	Calculate the probability of occupation of an energy level 0.02eV above the Fermi level at temperature 27°C.	**5**	**L3**	**CO3**

Module – 5

9	a.	Discuss timing in Linear motion, Uniform motion, Slow in and Slow out.	**8**	**L2**	**CO4**
	b.	Distinguish between Descriptive and Inferential statistics.	**6**	**L2**	**CO4**
	c.	In an optic fiber experiment, the light passing thorough the fiber, made a spot diameter of 8 mm on the screen. The distance between the end of the optical fiber cable and the screen is 3.1 cm. Calculate the angle of acceptance and numerical aperture of the given optical fiber.	**6**	**L3**	**CO5**
		OR			
10	a.	Describe Jumping and parts of jumping in animation.	**8**	**L2**	**CO4**
	b.	Discuss modeling of the probability for proton decay.	**6**	**L2**	**CO4**
	c.	A slowing – in object in an animation has a first frame distance 0.5m and the first slow in frame 0.35 m. Calculate the base distance and the number of frames in sequence.	**6**	**L3**	**CO4**

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