U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: I / II**
Branch: Computer Science Stream **Duration: 3 hrs.**
Course Code: 22PH1BSPCS / 22PH2BSPCS **Max Marks: 100**
Course: Applied Physics for Computer Science Stream **Date: 30.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Physical constants:

Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg
Electronic charge, $e = 1.602 \times 10^{-19}$ C
Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K
Permittivity of free space $= 8.85 \times 10^{-12}$ F/m
Speed of light, $c = 3 \times 10^8$ m/s
Planck constant, $h = 6.626 \times 10^{-34}$ Js
Mass of neutron, $m_n = 1.67 \times 10^{-27}$ kg
Mass of proton, $m_p = 1.67 \times 10^{-27}$ kg

		MODULE - I	CO	PO	Marks
1	a)	Describe the construction and working of semiconductor LASER with energy level diagram.	CO1	PO1	**8**
	b)	What is attenuation? Explain any two factors contributing to the fiber loss. Mention any three advantages of optical fibers over conventional communication systems.	CO1	PO1	**8**
	c)	The average output power of a LASER beam of wavelength 650nm is 10mW. Find the number of photons emitted per second by the LASER source.	CO1	PO2	**4**
		OR			
2	a)	Derive an expression for energy density of radiation in terms of Einstein's A & B coefficients.	CO1	PO1	**8**
	b)	Discuss point-to-point optical fiber communication. Also, mention any two disadvantages over the conventional communications system.	CO1	PO1	**8**
	c)	Light gathering capacity of an optical fiber is 0.479. If fractional index change is 0.005, calculate the refractive index of cladding.	CO1	PO2	**4**

			MODULE - II			
	3	a)	Define phase velocity and group velocity and obtain the relation between them in terms of wavelength.	*CO1*	*PO1*	**8**
		b)	Apply Schrodinger's wave equation to a particle confined to one dimensional potential well of infinite height, hence obtain the expressions for eigen values and eigen functions.	*CO1*	*PO1*	**8**
		c)	The speed of an electron is 100 m/s. The inherent uncertainty in its measurement is 0.06%. Evaluate the uncertainty that arises in the measurement of its position.	*CO1*	*PO2*	**4**
			OR			
	4	a)	What is wave function? Set up one dimensional time independent Schrodinger wave equation for a particle moving along x-axis.	*CO1*	*PO1*	**8**
		b)	State Heisenberg's uncertainty principle. Show that electron cannot exist inside the nucleus.	*CO1*	*PO1*	**8**
		c)	Calculate the de-Broglie wavelength associated with an electron having kinetic energy of 100 eV.	*CO1*	*PO2*	**4**
			MODULE - III			
	5	a)	What is Fermi factor? Discuss the variation of the Fermi factor with temperature and energy with suitable graph.	*CO1*	*PO1*	**8**
		b)	What is polarization in dielectrics? Describe any three types of polarization.	*CO1*	*PO1*	**8**
		c)	An elemental solid dielectric material has a polarizability of 7×10^{-40} Fm^2. Assuming the internal field to be Lorentz field. Calculate the dielectric constant for the material, If the material has 3×10^{28} atoms/m^3.	*CO1*	*PO2*	**4**
			MODULE - IV			
	6	a)	Derive an expression for the electrical conductivity of an intrinsic semiconductor and arrive at an expression for energy band gap.	*CO1*	*PO1*	**8**
		b)	Describe the classification of superconductors into soft and hard superconductors by using M-H graphs.	*CO1*	*PO1*	**8**

		c)	The superconducting transition temperature of lead is 7.26 K. The initial field at 0 kelvin is 64×10^3A/m. Calculate the critical field at 5 K.	*CO1*	*PO2*	**4**
			MODULE - V			
	7	a)	Mention the properties of Qubit. Elucidate the difference between Classical and Quantum computing.	*CO1*	*PO1*	**8**
		b)	Describe the construction and working of the Controlled NOT Gate, by mentioning its Matrix, Circuit, and Truth table.	*CO1*	*PO1*	**8**
		c)	A linear operator X operates such that X |0> = |1>, and X|1> = |0> Find the matrix representation of X.	*CO1*	*PO2*	**4**

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