CBCS SCHEME

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BPHYS102/202

First/Second Semester B.E./B.Tech. Degree Examination, June/July 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. M : Marks , L: Bloom's level , C: Course outcomes.
3. VTU Hand book is permitted.

		Module – 1	M	L	C
Q.1	a.	Explain the construction and working of semiconductor LASER with a neat sketch and energy level diagram.	9	L2	CO1
	b.	Discuss different types of optical fibers based on modes of propagation and RI profile.	6	L2	CO1
	c.	An optical fiber has refractive index of core and cladding of 1.55 and 1.50, respectively. Calculate its numerical aperture and angle of acceptance if it is kept in air.	5	L3	CO5
		OR			
Q.2	a.	Obtain the expression for energy density of radiation in term of Einstein's A and B coefficients.	8	L2	CO1
	b.	Define numerical aperture and derive an expression for numerical aperture of an optical fiber.	7	L2	CO1
	c.	In a diffraction grating experiment the Laser light undergoes first order diffraction at an angle of 19.3°. Find the wavelength of Laser light. Given the grating constant $d = 1.98 \times 10^{-6}$m.	5	L3	CO5
		Module – 2			
Q.3	a.	Setup one dimensional time independent Schrodinger wave equation.	8	L2	CO
	b.	State Heisenberg's uncertainty principle and apply the same to prove the non-existence of free electron inside the nucleus.	7	L2	CO
	c.	An electron is bound in an infinite potential well of width 0.18nm. Find its energy values in the first two allowed energy states.	5	L3	CO2
		OR			
Q.4	a.	Obtain an expression for Eigen function and Eigen energy values for a particle in an infinite potential well of width 'a'.	9	L2	CO2
	b.	What is wave function? Mention the properties of wave function and give its significance.	6	L2	CO2
	c.	Calculate the kinetic energy of a neutron in eV. Given: de –Broglie wave length is 1 Å and mass of neutron, $m_n = 1.674 \times 10^{-27}$Kg.	5	L3	CO2
		Module – 3			
Q.5	a.	Distinguish between classical computing and Quantum computing.	6	L2	CO2
	b.	Explain the CNOT gate and its operation on four different input states.	6	L2	CO2
	c.	Apply Pauli matrices on the state $\|0\rangle$ and $\|1\rangle$.	8	L3	CO2
		OR			
Q.6	a.	Explain the working of T-gate mentioning its matrix representation and truth table.	7	L2	CO2
	b.	Explain Orthogonality and Orthonormality with an example of each.	8	L2	CO2

	c.	A linear operator 'X' operates such that X|0> = |0> and X|1> = i|1>. Find the matrix representation of 'X'.	5	L3	CO2
		Module – 4			
Q.7	a.	Mention the failures of classical free electron theory and explain the assumptions of Quantum free electron theory of metals.	7	L2	CO3
	b.	Explain Meissner's effect and the variation of critical field with temperature.	8	L2	CO3
	c.	A lead wire has a critical field of 6.5×10^3 A/m at 0 Kelvin. The critical temperature is 7.18K. At what temperature the critical field will drop to 4.5×10^3A/m.	5	L3	CO3
		OR			
Q.8	a.	Define Fermi factor and explain the variation of Fermi factor with temperature and energy.	8	L2	CO3
	b.	Differentiate Type – I and Type – II superconductors.	8	L2	CO3
	c.	Calculate the probability of occupation of an energy level 0.02eV above level at temperature 27°C.	4	L3	CO3
		Module – 5			
Q.9	a.	Explain the importance of (i) size and scale and (ii) weight and strength, in animation.	7	L2	CO4
	b.	Mention the general pattern of Monte – Carlo method and hence explain the procedure to find the value of 'π'.	8	L2	CO4
	c.	In the case of animating a jump, the jump height is 2.5m and jump magnification is 5. Calculate the push height and push acceleration. Given gravitational acceleration is 10m/s.	5	L3	CO5
		OR			
Q.10	a.	Describe jumping and parts of jump.	9	L2	CO4
	b.	Distinguish between descriptive and inferential statics.	6	L2	CO4
	c.	On a particular place, volcanic eruption occurs once in every 100years on an average. Calculate the probability of volcanic eruption in a 100 years interval for K = 0, 1 and 2, assuming the Poisson's model appropriate.	5	L3	CO5

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