Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	2	P	H	Y	S	12	/	22

First / Second Semester B.E. Degree Supplementary Examinations, February 2025

PHYSICS FOR COMPUTER SCIENCE & ENGINEERING STREAM

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Use of Physics Formula Handbook is permitted.
3. Missing data, if any, may be suitably assumed.

Q. No		Question	Marks	(RBTL:CO:PO)
		Module-1		
1.	**a.**	Define phase velocity and group velocity and hence derive expression for group velocity.	**08**	**(2 :1:1 :1 : 1)**
	b.	State and explain Heisenberg's uncertainty principle and Show that electron does not exist inside the nucleus by this principle.	**08**	**(2 :1:1 :1 : 1)**
	c.	A particle of mass 940 MeV/C^2 has kinetic energy 0.5 KeV. Calculate its de Broglie wavelength, where C is velocity of light.	**04**	**(3:1: 2: 1: 3)**
		(OR)		
2.	**a.**	Derive one-dimensional Schrödinger's wave equation.	**08**	**(2 :1:1 :1 : 1)**
	b.	Starting from Schrödinger's time independent wave equation, derive the expression for energy Eigen values for an electron in one-dimensional potential well of infinite height.	**08**	**(2 :1:1 :1 : 1)**
	c.	The ground state energy of an electron in one-dimensional potential well is 5.6 meV. If the width of the well is doubled calculate the ground state energy.	**04**	**(3:1: 2: 1: 3)**
		Module-2		
3.	**a.**	Derive the expression for energy density in terms of Einstein's coefficients.	**08**	**(2 :2:1 :1 : 1)**
	b.	Explain the construction and working of semiconductor laser with neat diagrams.	**08**	**(2 :2:1 :1 : 1)**
	c.	A gas laser is generating a laser beam with an average power of 3.5 mW. Determine the number of atoms emitted per second by the laser. Given the wavelength of the emitted radiation is 6328 A^0.	**04**	**(3:2:2: 1: 3)**
		(OR)		
4.	**a.**	Describe different types of optical fibers with neat diagrams for geometry, refractive index profile and propagation of waves.	**08**	**(2 :2:1 :1 : 1)**
	b.	Define attenuation and hence derive the expression for attenuation coefficient. Explain the various causes for optical fiber losses.	**08**	**(2 :2:1 :1 : 1)**
	c.	The refractive indices of core and cladding are 1.50 and 1.48 respectively in an optical fiber. Calculate the numerical aperture and acceptance angle.	**04**	**(3:2:2: 1: 3)**

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

Module-3

5.	**a.**	Derive expression for electrical conductivity and electrical resistivity for the metal.	**08**	**(2 :3:1 :1 : 1)**
	b.	Explain Matthiessen's rule and derive equation for total resistivity in terms of mean collision time.	**08**	**(2 :3:1 :1 : 1)**
	c.	Calculate the mobility of electron in copper assuming that each atom contributes one free electron for conduction. Given resistivity of copper is 1.7×10^{-8} Ohm-m, atomic weight 63.54, density 8.96×10^{3} Kg/m^{3}and Avogadro's number 6.025×10^{23}/mol.	**04**	**(3:3: 2: 1: 3)**

(OR)

6.	**a.**	Describe types of superconductors using M-H graphs.	**08**	**(2 :3:1 :1 : 1)**
	b.	Write a brief note on Mag-Lev vehicles and SQUID.	**08**	**(2 :3:1 :1 : 1)**
	c.	Lead has superconducting transition temperature of 7.26 K. If the initial field at 0K is 50×10^{3} Am-1 Calculate the critical field at 6k.	**04**	**(3:3: 2: 1: 3)**

Module-4

7.	**a.**	Define frames, frames per second, size, scale and weight.	**05**	**(2 :4:1 :1 : 1)**
	b.	Illustrate the odd rule and odd rule multipliers with a suitable example.	**05**	**(2 :4:1 :1 : 1)**
	c.	Define diffraction and explain determination of wavelength of mercury source using diffraction grating in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

(OR)

8.	**a.**	Describe Jumping and parts of jump.	**05**	**(2 :4:1 :1 : 1)**
	b.	Write a brief note on Monte Carlo method.	**05**	**(2 :4:1 :1 : 1)**
	c.	Define dielectric constant and explain determination of dielectric constant of the dielectric material by charging and discharging of the capacitor in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

Module-5

9.	**a.**	Explain the concept of single particle quantum interfacing.	**05**	**(2 :4:1 :1 : 1)**
	b.	Explain briefly the Bloch sphere.	**05**	**(2 :4:1 :1 : 1)**
	c.	What is optical fiber, and explain determination of acceptance angle and numerical aperture of the optical fiber in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

(OR)

10	**a.**	Discuss Pouli X- gate and write its truth table.	**05**	**(2 :4:1 :1 : 1)**
	b.	Discuss the SWAP gate and its operation on four different input states also write its truth table.	**05**	**(2 :4:1 :1 : 1)**
	c.	Explain determination of magnetic field intensity along the axis of a circular coil carrying current by deflection method in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

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