Basavarajeswari Group of Institutions

2022 SCHEME

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 Summer Semester Examinations, September/October 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:PI)*
		Module-1		
1.	**a.**	Derive the expression for de-Broglie wavelength and extend to an electron particle.	**08**	**(2 :1:1 :1 : 1)**
	b.	Define phase velocity and group velocity & hence derive the expression for group velocity.	**08**	**(2 :1:1 :1 : 1)**
	c.	Calculate de-Broglie wavelength of an electron accelerated under a potential difference of 100 V.	**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.	An electron is bound in a one dimensional potential will of width 1 A^0, but of infinite height. Find its energy values in the ground state and also in the first two excited states.	**04**	**(3:1: 2: 1: 3)**
		Module-2		
3.	**a.**	Explain the terms induced absorption, spontaneous emission and stimulated emission with energy level diagram.	**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 pulsed laser has an average power output of 1.5 mW per pulse and the pulse duration is 20 ns. The number of photons emitted per pulse is 1.0472×10^8. Find the wavelength of the emitted laser.	**04**	**(3:2:2: 1: 3)**
		(OR)		
4.	**a.**	Explain numerical aperture and acceptance angle and derive the relation for numerical aperture and acceptance angle of an optical fiber.	**08**	**(2 :2:1 :1 : 1)**
	b.	Describe different types of optical fibers with neat diagrams for geometry, refractive index profile and propagation of waves	**08**	**(2 :2:1 :1 : 1)**
	c.	The refractive indices of core and cladding are 1.565 and 1.498 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.**	State assumptions of classical free electron theory and explain three failures of CFET.	**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.	For an electron electric field is applied is 100 V/m, its drift velocity is 0.7 m/s, Calculate mobility of electron.	**04**	**(3:3: 2: 1: 3)**

(OR)

6.	**a.**	Describe superconductors into Soft and Hard superconductors using M-H graphs.	**08**	**(2 :3:1 :1 : 1)**
	b.	Explain Meglev vehicle and SQUID briefly.	**08**	**(2 :3:1 :1 : 1)**
	c.	Calculate the critical magnetic field at 1 K. For a metal If its critical temperature is 4.15 K, and the critical magnetic field at 0 K is 3.276×10^6 Am-1.	**04**	**(3:3: 2: 1: 3)**

Module-4

7.	**a.**	Discuss timing in linear motion, uniform motion, slow in and slow out.	**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 Fermi energy and explain determination of Fermi energy of a copper in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

(OR)

8.	**a.**	Discuss single quantum interfacing with diagram.	**05**	**(2 :4:1 :1 : 1)**
	b.	Write difference between classical and Quantum computing.	**05**	**(2 :4:1 :1 : 1)**
	c.	What is Zener diode and explain determination of Knee voltage, Zener break down voltage and forward resistance in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

Module-5

9.	**a.**	State Moor's law and discuss it end.	**05**	**(2 :4:1 :1 : 1)**
	b.	Write a brief note on Monte Carlo method	**05**	**(2 :4:1 :1 : 1)**
	c.	Define resonance and explain determination of resonant frequency and quality factor in series and parallel circuit in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

(OR)

10.	**a.**	Discuss Hadamard gate and write its truth table.	**05**	**(2 :4:1 :1 : 1)**
	b.	Discuss phase gate and write truths table.	**05**	**(2 :4:1 :1 : 1)**
	c.	What is transistor and explain determination input and output resistance and amplification factor in the laboratory.	**10**	**(2 :5:1 :1 : 1)**

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