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	E	12	/	22

First / Second Semester B.E. Degree Summer Semester Examinations, September/October 2025

PHYSICS FOR ELECTRICAL & ELECTRONICS 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.**	State and explain Heisenberg's uncertainty principle. Show that electron does not exist inside the nucleus by this principle.	**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.	Electron is bound in one-dimensional potential well of infinite height and width of 0.2 Å, Calculate its energy values in the ground state and in the first two excited states.	**04**	**(3:1:1.2.1)**
		(OR)		
2.	**a.**	Explain de-Broglie hypothesis, de-Broglie wave length by analogy and derive de-Broglie wavelength for an electrons.	**08**	**(2:1:1.1.1)**
	b.	Define phase velocity, group velocity and hence derive the expression for group velocity.	**08**	**(2:1:1.1.1)**
	c.	A particle of mass 0.6 M eV/C^2 has kinetic energy 120 eV. Calculate its de Broglie wavelength, where C is velocity of light.	**04**	**(3:1:1.2.1)**
		MODULE – 2		
3.	**a.**	Derive the expression for internal fields in solid and liquid dielectrics.	**08**	**(2:2:1.1.1)**
	b.	Explain qualitatively BCS theory of superconductors.	**08**	**(2:2:1.1.1)**
	c.	The polarizability of neon gas atom is 0.35×10^{-40} Fm, if the gas contains 2.7×10^{28} atoms/m^3. Calculate its relative dielectric constant.	**04**	**(3:2:1.2.1)**
		(OR)		
4.	**a.**	Explain type – I and type – II superconductor based on magnetisation curve with examples.	**08**	**(2:2:1.1.1)**
	b.	Explain Meglev vehicle and SQUID briefly.	**08**	**(2:2:1.1.1)**
	c.	A superconducting tin has critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Calculate the critical field at 2 K.	**04**	**(3:2:1.2.1)**
		MODULE – 3		
5.	**a.**	Explain the terms induced absorption, spontaneous emission and stimulated emission with energy level diagram.	**08**	**(2:3:1.1.1)**

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

	b.	Explain the principle, construction and working of semiconductor laser with neat diagrams.	**08**	**(2:3:1.1.1)**
	c.	The average output power laser source emitting a laser beam of wavelength 632.8 nm is 5 mW. Calculate the number of photons emitted per second by the laser source.	**04**	**(3:3:1.2.1)**
		(OR)		
6.	**a.**	Explain numerical aperture and acceptance angle and derive the relation for numerical aperture and acceptance angle of an optical fibre.	**08**	**(2:3:1.1.1)**
	b.	Describe different types of optical fibre with neat diagrams for geometry, refractive index profile and propagation of waves.	**08**	**(2:3:1.1.1)**
	c.	The refractive indices of core and cladding are 1.50 and 1.48 respectively in an optical fibre. Calculate the numerical aperture and acceptance angle.	**04**	**(3:3:1.2.1)**
		MODULE – 4		
7.	**a.**	Derive the expression for conductivity in semiconducting materials.	**05**	**(2:4:1.1.1)**
	b.	Derive the expression for Fermi level in intrinsic semiconductor.	**05**	**(2:4:1.1.1)**
	c.	Describe an experiment to determine the dielectric constant of a dielectric material by charging and discharging of a capacitor.	**10**	**(3:5:1.2.1)**
		(OR)		
8.	**a.**	What is Hall effect? Derive the expression for Hall coefficient of a semiconductor.	**05**	**(1:4:1.1.1)**
	b.	Explain the construction, working of a photodiode with I-V characteristics and power responsivity.	**05**	**(2:4:1.1.1)**
	c.	Describe an experiment to determine the knee voltage, Zener breakdown voltage in laboratory.	**10**	**(3:5: .1.3)**
		MODULE – 5		
9.	**a.**	Explain the gauss law, ampere law and faradays laws of electromagnetic.	**05**	**(2:4:1.1.1)**
	b.	Derive the wave equation in differential form in free space using Maxwell's equations.	**05**	**(2:4:1.1.1)**
	c.	Describe an experiment to determine resonant frequency and quality factor of LCR series and parallel circuits.	**10**	**(3:5:2.1.3)**
		(OR)		
10.	**a.**	State the gauss divergence theorem and stokes theorem of vector calculus.	**05**	**(3:4:1.1.1)**
	b.	Derive the expression for displacement current of dielectric material.	**05**	**(2:4:1.1.1)**
	c.	Describe an experiment to determine the wavelength of Hg source using diffraction gratting.	**10**	**(3:5:2.1.3)**

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