

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN

--	--	--	--	--	--	--	--	--	--

Course Code

1	B	P	H	Y	E	C	2	0	2
---	---	---	---	---	---	---	---	---	---

First Semester B.E. Degree Examinations, February 2026

PHYSICS FOR ELECTRONICS & COMMUNICATION ENGINEERING STREAM**(Electronics & Communication Engineering)**

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions choosing ONE Full Question from each Module

2. Formula Handbook is permitted

3. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTl:CO: PI)</u>
<u>MODULE – 1</u>			
1.	a. Define phase velocity & group velocity and hence derive the expression for group velocity.	08	(2:1:1.1.1)
	b. Derive one-dimensional time independent Schrödinger's wave equation for matter waves.	08	(2:1:1.1.1)
	c. Find the smallest uncertainty in the position of an electron moving with a uncertainty in velocity of 3×10^7 m/s.	04	(3:1:1.2.1)
(OR)			
2.	a. Explain de-Broglie hypothesis, de-Broglie wave length by analogy and de-Broglie wavelength for an electron.	08	(2:1:1.1.1)
	b. State & explain Heisenberg's uncertainty principle and explain broadening of spectral line using the principle.	08	(2:1:1.1.1)
	c. Find the kinetic energy of an electron with de-Broglie's wavelength of 0.2 nm.	04	(3:1:1.2.1)
<u>MODULE – 2</u>			
3.	a. Derive the expression for Fermi level in intrinsic semiconductor with a neat diagram showing the Fermi level.	08	(2:2:1.1.1)
	b. Explain the temperature dependence of resistivity of a conductor (Matheissen's rule).	08	(2:2:1.1.1)
	c. Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 200 K and 400 K in a material.	04	(3:2:1.2.1)
(OR)			
4.	a. Explain hall effect. Derive the expression for Hall coefficient of a semiconductor	08	(2:2:1.1.1)
	b. Explain the assumptions of quantum free electron theory and merits of quantum free electron theory.	08	(2:2:1.1.1)
	c. At what temperature can we expect a 10 % probability that electron in silver have an energy 1% above the Fermi level, the Fermi energy of silver is 5.5 eV.	04	(3:2:1.2.1)

MODULE – 3

5. a. Derive the expression for energy density equation in terms of Einstein's coefficients. 08 (2:3:1.1.1)
- b. Explain the application with neat block diagram of optical fiber point-to-point communication. 08 (2:3:1.1.1)
- c. The angle of acceptance of an optical fiber is 30° when kept in air, find the angle of acceptance when it is kept in a medium of refractive index 1.33. 04 (3:3:1.2.1)

(OR)

6. a. Explain the principle, construction and working of He-Ne laser with neat diagrams. 08 (2:3:1.1.1)
- b. Derive the expression for numerical aperture of an optical fiber. 08 (2:3:1.1.1)
- c. Find the ratio of population of two energy levels associated with an wave length separation of $6340 \text{ \AA}$ emitted by spontaneous emission at 340 K. 04 (3:3:1.2.1)

MODULE – 4

7. a. Explain the BCS theory of superconductors. 05 (2:4:1.1.1)
- b. Explain the applications of superconductivity in SQUID and MAGLEV. 05 (2:4:1.1.1)
- c. Describe an experiment to determine input and output characteristics of transistor. 10 (3:5:2.1.3)

(OR)

8. a. Explain the types of superconductors as type I and type II superconductors. 05 (1:4:1.1.1)
- b. Explain the Josephson junction of a superconductor. 05 (2:4:1.1.1)
- c. Describe an experiment to determine numerical aperture of an optical Fiber. 10 (3:5:2.1.3)

MODULE – 5

9. a. Explain direct and indirect band gap semiconductors. 05 (2:4:1.1.1)
- b. Explain construction and working of photo-diode. 05 (2:4:1.1.1)
- c. Describe an experiment to plot Zener diode I-V characteristics and hence determine Zener breakdown voltage. 10 (3:5:2.1.3)

(OR)

10. a. Explain briefly piezo electric sensors. 05 (3:4:1.1.1)
- b. Explain light dependent resistors. 05 (2:4:1.1.1)
- c. Describe an experiment to study magnetic field at any point along the axis of a circular coil. 10 (3:5:2.1.3)

**** ** ***