

USN

Course Code 1BPHYS102/202

First /Second Semester B.E. Degree Examinations, July 2026

PHYSICS FOR COMPUTER SCIENCE STREAM

(CSE, AIML, CSE-AI & CSE-DS)

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>(RBT:CO: PI)</u>
<u>Module-1</u>			
1.	a. Derive the expression for de-Broglie wavelength and extend to electron particle.	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. The velocity of a hydrogen atom in the ground state is 2.19×10^{-6} m/s. Calculate the wavelength of the de-Broglie wave associated with its motion.	04	(3:1:2:1:3)
(OR)			
2.	a. Derive one- dimensional Schrödinger's time independent 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 an infinite 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)
<u>Module-2</u>			
3.	a. Write assumptions of classical free electron theory and explain three failures of CFET.	08	(2:3:1:1:1)
	b. Define Fermi energy. Explain variation of Fermi factor with temperature and energy.	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 in a material.	04	(3:2:2:1:3)
(OR)			
4.	a. Derive expression for conductivity in intrinsic semiconducting materials.	08	(2:3:1:1:1)
	b. Explain Hall effect and derive expression for Hall coefficient.	08	(2:2:1:1:1)
	c. The Hall coefficient of a specimen of silicon is 3.66×10^{-4} m ³ /C. The resistivity of the specimen is 8.93×10^{-3} m. Find the density and mobility of the charge carriers.	04	(3:2:2:1:3)

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

Module-3

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| 5. | 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 semiconductor laser has a peak emission radiation of wavelength of 1.24 μm . What is its band gap value in eV? | 04 | (3:2:2:1:3) |

(OR)

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| 6. | a. | Define Lambert's law and derive expression for attenuation coefficient (α). | 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. | Calculate the numerical aperture and acceptance angle of a given optical fiber. If the refractive indices for core and cladding are 1.623 and 1.522 respectively. | 04 | (3:2:2:1:3) |

Module-4

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| 7. | a. | Explain Meissner's effect and show that superconductor is a perfect diamagnetic. | 05 | (2:4:1:1:1) |
| | b. | Describe types of superconductors with the help of M-H graphs. | 05 | (2:4:1:1:1) |
| | c. | Define diffraction and explain determination of wavelengths of mercury source using diffraction grating in the laboratory. | 10 | (2:5:1:1:1) |

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| 8. | a. | Explain BCS theory of superconductivity in brief. | 05 | (2:4:1:1:1) |
| | b. | Explain SQUID briefly and write its applications. | 05 | (2:4:1:1:1) |
| | c. | 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

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| 9. | a. | State Moore's law and explain end of Moore's law. | 05 | (2:4:1:1:1) |
| | b. | Explain the single particle quantum interfacing with figure. | 05 | (2:4:1:1:1) |
| | c. | What is optical fiber and explain determination of the acceptance angle and numerical aperture of the given optical fiber in the laboratory. | 10 | (2:5:1:1:1) |

(OR)

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| 10. | a. | Discuss the working of Phase gate (S-Gate) mentioning its matrix representation and truth table. | 05 | (2:4:1:1:1) |
| | b. | Discuss the CNOT gate and its operation on four different input states and mentioning its matrix representation and truth table. | 05 | (2:4:1:1:1) |
| | c. | Define magnetic field intensity and explain determination of the 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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