



First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026
Applied Physics for EEE Stream

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks , L: Bloom's level , C: Course outcomes.
 3. VTU Formula Handbook is permitted.*

Module – 1			M	L	C
Q.1	a.	Obtain expression for Eigen values and Eigen functions for a particle in a potential well of infinite weight , using Schrodinger time independent wave equation.	8	L2	CO1
	b.	Explain de-Broglie concept of matter waves and obtain de-Broglie wavelength by analogy. Also express de-Broglie wavelength in different forms.	7	L2	CO1
	c.	An electron has the velocity 800 m/s measured with uncertainty of 0.04%. Calculate the uncertainty in finding the position of electron.	5	L3	CO1
OR					
Q.2	a.	State and explain Heisenberg's uncertainty principle. Show that electron does not exist in the nucleus using this principle.	8	L2	CO1
	b.	Derive Schrodinger time independent wave equation in 1 dimensional form.	7	L2	CO1
	c.	Calculate the energy in first two states for an electron in one dimensional potential well of width 10 Å.	5	L3	CO1
Module – 2					
Q.3	a.	Explain Fermi factor and discuss the variation of Fermi factor with temperature and energy.	8	L2	CO2
	b.	Explain Polar and Non polar dielectrics with suitable examples.	7	L2	CO2
	c.	A certain super conducting material has critical temperature 10 K. It has critical magnetic field at 0 K as 0.2T. Calculate the critical magnetic field at 8 K.	5	L3	CO2
OR					
Q.4	a.	Explain Internal field in dielectrics. Using the expression for internal field , obtain Clausius – Mossotti equation.	8	L2	CO2
	b.	Discuss Meissner effect and hence the classification of super conductors.	7	L2	CO2
	c.	Evaluate the probability of occupying electron in the energy state 0.04 eV above Fermi level at 300 K.	5	L3	CO2
Module – 3					
Q.5	a.	Obtain the expression for energy density of radiation in terms of Einstein's coefficients.	8	L2	CO1
	b.	Discuss the construction and working of CO ₂ LASER with necessary diagram.	7	L2	CO1

	c.	The refractive index of core and cladd are 1.55 and 1.45 respectively in an optical fiber. Calculate the numerical aperture and angle of acceptance , if the fiber is in air.	5	L3	CO1
OR					
Q.6	a.	Obtain an expression for numerical aperture of an optical fiber with relevant ray diagram. Discuss the condition for light propagation in the fiber.	8	L2	CO1
	b.	Explain the types of optical fibers with relevant diagrams.	7	L2	CO1
	c.	Calculate the ratio of population between two energy levels leading to laser emission of wavelength 630 nm at 400 K.	5	L3	CO1
Module – 4					
Q.7	a.	Discuss gradient of a scalar, divergence of a vector and curl of a vector with example and significance.	8	L2	CO3
	b.	State and prove Gauss Divergence Theorem and state Stoke's Theorem.	7	L2	CO3
	c.	Calculate the capacitance required to give the resonant frequency of a LCR series circuit to be 600 Hz if the inductance used is 100 mH.	5	L3	CO5
OR					
Q.8	a.	Discuss Line integral , Surface integer and Volume integral with necessary diagram.	8	L2	CO3
	b.	Explain the concept of displacement current and obtain an expression for it, in terms of area and distance between the plates of a capacitor.	7	L2	CO3
	c.	An optical fiber produces a spot on the screen with 0.5 cm diameter. If the screen to light emerging end of the fiber is 2 cm, calculate the Numerical aperture.	5	L3	CO5
Module – 5					
Q.9	a.	State and explain Hall Effect. Obtain an expression for Hall Coefficient.	8	L2	CO4
	b.	Explain the construction , working and application of photo diode.	7	L2	CO4
	c.	The Intrinsic Germanium at 200 K has carrier concentration $2.4 \times 10^{19} / \text{m}^3$, electron mobility = $0.39 \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$, hole mobility = $0.19 \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$. Find resistivity of the sample.	5	L3	CO4
OR					
Q.10	a.	Explain the construction and working of semiconductor LASER diode with energy level diagram.	8	L2	CO4
	b.	Obtain an expression for electrical conductivity of semiconductor. Extend the study for p type and n type semiconductor.	7	L2	CO4
	c.	The Hall coefficient of a material is $-3.68 \times 10^{-5} \text{ m}^3/\text{C}$. What is the type of charge carrier and find the carrier concentration.	5	L3	CO4