



RV Educational Institutions
RV College of Engineering

Autonomous
Institution Affiliated
to Visvesvaraya
Technological
University, Belagavi

Approved by AICTE,
New Delhi

DEPARTMENT OF PHYSICS

Course: Quantum Physics for Engineers	CIE: II First semester 2022-2023	Maximum marks: 50
Course code: 22PHY22C	Physics Cycle: Computer Science Stream	Time: 90 Minutes Date: 21/8/2023

Instructions to candidates:

i. *Answer all the questions.*

1. *Physical constants:* $h = 6.625 \times 10^{-34} \text{ Js}$, $m_e = 9.1 \times 10^{-31} \text{ kg}$, $k_B = 1.38 \times 10^{-23} \text{ J/K}$.

Q. No		M	BT	CO
1a.	For a pure Si semiconductor derive a general expression for electron concentration in the conduction band.	7	L2	2
b.	A fiber surrounded by air has a numerical aperture of 0.369. Will light entering the fiber at an angle of incidence of 25° remain in the fiber, or will it escape? Why?	3	L3	3
2a.	Describe in detail the basics of point-to-point communication and describe the role of repeater.	7	L2	1
b.	A bar of n-type Germanium bar of dimensions (1cm x 0.1cm x 0.1 cm) in the order of length, width and thickness is placed in a magnetic field of 0.2 T. If the drift velocity of the electrons is 4 cm/s calculate the Hall voltage produced in the bar. Assume the magnetic field to be along the direction of width.	3	L1	3
3a.	With a neat figure derive the expression for numerical aperture of an optical fibre and the fractional index change.	7	L3	2
b.	With a neat sketch explain the structure and working of GRIN fiber.	3	L1	1
4a.	Define Hall Effect and with a neat figure arrive at an expression for hall coefficient for a pentavalent doped semiconductor.	7	L3	2
b.	For Silicon at 30°C , calculate the number of states per unit energy per unit volume at an energy 26meV above the bottom of the conduction band ($m_e^* = 1.18 m_e$)	3	L3	3
5a.	With a neat figure describe the variation of Fermi level with respect to temperature for an intrinsic semiconductor doped with a trivalent impurity.	7	L1	1
b.	Define fermi factor, fermi energy level and sketch the variation of fermi level when $T \neq 0\text{K}$.	3	L2	1

COs	CO 1	CO 2	CO 3
Marks	20	21	9
