GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– I & II (NEW) EXAMINATION – WINTER 2019

Subject Code: 3110018   **Date: 02/01/2020**
Subject Name: Physics
Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Enlist the assumptions of free electron theory.	**03**
	(b)	Give the difference between Direct and Indirect band gap.	**04**
	(c)	Explain forward and reverse bias conditions in PN junction diode.	**07**
Q.2	**(a)**	Define Intrinsic and extrinsic semiconductor .	**03**
	(b)	The thermal and electrical conductivity of Cu at 20˚C are 390Wm^{-1}K^{-1} and 5.87x10^7 (Ωm)$^{-1}$ respectively. Calculate the Lorentz number.	**04**
	(c)	Explain Schottky diode in detail.	**07**
		OR	
	(c)	Explain the dependence of Fermi level on temperature	**07**
Q.3	**(a)**	Explain Drude model	**03**
	(b)	Fermi energy of a given substance is 7.9 eV. What is the average energy and speed of electron in this substance at 0 K?	**04**
	(c)	Explain photovoltaic effect. With required diagrams discuss construction and working of solar cell.	**07**
		OR	
Q.3	**(a)**	Write a short note on exciton.	**03**
	(b)	Consider two-dimensional square lattice of side 3.0 Å. At what electron momentum values do the sides of first Brillouin zone appear? What is the energy of free electron with this momentum?	**04**
	(c)	Derive an equation of joint density of states.	**07**
Q.4	**(a)**	Define Hall effect. Give its physical significance.	**03**
	(b)	2.0Cm wide and 1.0 mm thick copper strip is placed in a magnetic field 1.5Wb/m^2 perpendicular to the strip. Suppose a current of 200A is set up in the strip what will be the Hall potential appeared across the strip? (n=8.4x10^{28} electrons /m^3).	**04**
	(c)	Discuss UV-VIS method for band gap measurement of semiconductor.	**07**
		OR	
Q.4	**(a)**	Discuss Fermi golden rule.	**03**
	(b)	The transmitted intensity is 0.4 times intensity of incident light. If this light is incident on a semiconductor having a thickness of 0.5cm then find absorption coefficient.	**04**
	(c)	Explain four probe method. Derive an equation to calculate resistivity of a thin sample.	**07**

Q.5 **(a)** Write short note cryotron. **03**
    (b) Explain London's penetration depth. **04**
    (c) Give the difference between type 1 and type 2 superconductor. **07**

OR

Q.5 **(a)** Write short note on SQUID. **03**
    (b) Calculate the critical current for a superconducting wire of lead having a diameter of 2 mm at 2 K. Critical temperature for lead is 4 K and Hc (0) = 6.5 X 10^4 A/m. **04**
    (c) Explain the properties of superconductors in detail. **07**

****