

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-I &II (NEW) EXAMINATION – SUMMER-2019****Subject Code: 3110018****Date: 03/06/2019****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) Give formation and applications of SQUID.	03
	(b) Explain intrinsic and extrinsic semiconductors with necessary diagram.	04
	(c) What is PN junction diode? What is external bias? Describe its forward and reverse bias conditions with appropriate diagram.	07
Q.2	(a) What is photo conductivity, photoluminescence, phototransistor?	03
	(b) Calculate the energy gap of Si, given that radiation of wavelength 11,000 Å is incident on it. Also find allowed wavelength for Ge with energy gap 0.90 eV.	04
	(c) Write a note on energy band diagram and formation of energy bands.	07
	OR	
	(c) Define Hall effect and Hall coefficient. Derive equation to find Hall voltage. What does it signify?	07
Q.3	(a) Differentiate between soft and hard superconductors	03
	(b) What is London penetration depth? Derive its equations.	04
	(c) Derive equations for n-type semiconductor to determine dependence of fermi level on temperature and doping concentration.	07
	OR	
Q.3	(a) The critical current density equal to $1.71 \times 10^8 \text{ A/m}^2$ is required to change a superconducting wire of radius 0.5 mm at 4.2 K. If the critical temperature of the material is 7.18 K, calculate the maximum value of the critical magnetic field.	03
	(b) Explain BCS theory for superconductivity.	04
	(c) Write a note on metal semiconductor junctions.	07
Q.4	(a) Write a note on exciton.	03
	(b) Give details of applications of solar cell (at least 4)	04
	(c) What is radiative and non-radiative transition. Explain in brief the optical joint density of states.	07
	OR	
Q.4	(a) What are direct and indirect band gap?	03
	(b) What is deep level transient spectroscopy (DLTS)? Give its experimental procedure.	04
	(c) Discuss the technique to obtain band gap by UV-Vis spectroscopy using absorption or transmission.	07
Q.5	(a) What are capacitance voltage measurements?	03
	(b) Consider n-type silicon semiconductor with a length of 100 μm, cross sectional area 10^{-7} cm^2 , minority charge carrier life time 10^{-6} s , μ_e is $0.13 \text{ m}^2 / \text{Vs}$ and μ_h is $0.05 \text{ m}^2 / \text{Vs}$. Find (a) Electron transit time	04

- (b) Photo conductor gain when voltage applied to the photoconductor is 12 V
- (c) Discuss Van Der Pauw method. **07**
- OR**
- Q.5** (a) What is the cause and remedy for optical loss in photovoltaic cell? **03**
- (b) State principle and discuss working of semiconductor laser. **04**
- (c) What is photovoltaic effect? Explain construction and working of a solar cell with suitable diagram **07**
