# 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 $1.71 \times 10^8$ 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, $\mu_e$ is 0.13 m$^2$ / Vs and $\mu_h$ is 0.05 m$^2$ / 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**

<div align="center"><strong>OR</strong></div>

**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       **07**
cell with suitable diagram

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