Q.P. Code : **10029**

(3 Hours) [Total Marks :100]

Note: 1) Figures to the right indicate full marks.
2) All questions are compulsory.
3) Neat diagrams should be drawn whenever necessary.
4) Use of non-programmable calculators/log tables is allowed.
5) Symbols have their usual meaning unless otherwise stated.

1. a) Attempt **any TWO**:
   i) Discuss the phenomenon of thermionic emission in metals. Obtain Richardson -Dushman equation for the emission current density. **10**
   ii) State the salient features of superconductivity. Explain how the superconducting transition temperature varies with magnetic field. **10**
   iii) Discuss Kronig Penney model for the motion of an electron in a periodic potential. Explain the formation of energy bands on the basis of this model. **10**

2. Attempt **any TWO:**
   i) What is ferromagnetism? Discuss Weiss field theory of Ferromagnetism. Deduce Curie Weiss law. **10**
   ii) Obtain an expression for concentration of electrons in an intrinsic semiconductor. **10**
   iii) Set up the continuity equation for the charge carriers in an extrinsic semiconductor. **10**

3. Attempt **any TWO:**
   i) Draw the circuit of a transistorized monostable multivibrator. Explain its working with the help of different waveforms. **10**
   ii) Sketch the basic structure of an n-channel JFET. Explain the working along with characteristic curves. **10**
   iii) Explain the use of SCR as full wave rectifier. Derive the equation for its output voltage **10**

4. Attempt **any TWO:**
   i) With the help of schematic diagram, explain how 555 timer can be used as an astable multivibrator. **10**
   ii) Explain how OPAMP can be used in a log amplifier. Derive the relation between the output and the input. **10**
   iii) Explain the working of TTL NAND gate **10**

[TURN OVER]

5. Attempt **any FOUR:**

i)	Explain collision time and relaxation time of free electrons in metals.	5
ii)	Write a note on Type I superconductors.	5
iii)	State any two applications of Hall Effect.	5
iv)	Write a note on optocouplers.	5
v)	Explain the following terms used for a DIFF amplifier : input bias scurrent, input offset voltage and CMRR	5
vi)	Explain different types of registers.	5
