

EN 404 / ET 405 - Electronics Engineering Materials and Components

P. Pages : 2

Time : Three Hours



GUG/W/18/1557

Max. Marks : 80

- Notes :
1. All questions carry marks. as indicated.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Explain magnetic hysteresis curve. Why is it called hysteresis curve? Discuss coercive force and retentivity with the help of B-H curve. **8**
b) Derive an expression for electronic polarizability. **8**

OR

2. a) Assuming that the atom in a solid are surrounded cubically by other atoms show that **8**
$$E_{i(\text{Lorentz})} = E + \frac{P}{3\epsilon_0}$$

b) A what is electronic Polarization? Prove that relative dielectric constant of a gas showing this type of polarization is given by $\epsilon_r = 1 + 4\pi NR^3$ where R is the radius of the atom and N is the number of atoms per unit volume. **8**
3. a) The following data is known for copper Density = 8.92 g/cc, **8**
Resistivity = 1.73×10^{-8} ohm-m Atomic weight = 63.5. Calculate the mobility and average time of collision of the electrons in copper.
b) Define current density, mobility, drift velocity and mean free path. How they are related to the applied field. **8**

OR

4. a) What do you understand by superconductivity? How is the property of superconductivity influenced by the external magnetic field? What is critical current? **8**
b) State and explain the factors affecting the resistivity of conducting materials. **8**
5. a) What is doping? Discuss intrinsic and extrinsic semiconductors. Explain the terms minority and majority carriers. **8**
b) What are different types of diodes? Discuss each briefly. **8**

OR

6. a) A unijunction transistor used for triggering the silicon controlled rectifier has $RB_1 = 4k\Omega$ and $RB_2 = 2.5k\Omega$. Find (a) the value of intrinsic stand-off ratio and (b) the peak-point voltage if $V_{BB} = 15V$. Take the barrier potential (V_D) as 0.7 V. 2
- b) Explain the construction and working of Unijunction transistor. 6
- c) Explain the working of SCR. Draw its forward and reverse characteristics. 8
7. a) Discuss the following steps for fabrication of ICS :- 8
- i) Wafer Preparation
- ii) Epitaxial Growth
- iii) Photolithographic process.
- b) Name the materials used to make LED. Explain the working of LED in brief. 8

OR

8. a) Explain the difference between spontaneous emission and stimulated emission. How stimulated emission produces laser light? 8
- b) Explain the construction and working of a Laser diode. What type of materials are used in their construction? 8
9. a) Discuss the synthesis of nanoparticles by chemical reduction method. 8
- b) Discuss the various steps involved in sol-gel process for the synthesis of nanoporous materials. 8

OR

10. a) Write an account on carbon nanotubes. Explain plasma arcing method for synthesis of CNTs. 8
- b) Explain chemical vapour. Deposition with basic principle, precursors used, chemical reactions involved, advantages and applications. 8
