

Name of the Department : Physics
Name of Course : B.Sc. Prog. (Electronics) _CBCS_DSE
Semester : V- Semester
Name of the Paper : Semiconductor Device Fabrication
Unique Paper Code : 42517511
Question Paper Set Number : Set-A

Duration: 3 Hours

Maximum Marks: 75

All questions carry equal marks. Attempt any four of the following questions.

1. Explain Schottky and Frenkel defects in a crystal with suitable diagram. Draw the energy band diagram of a heavily doped n-type and p-type semiconductor and discuss the effect of temperature on the Fermi level. Write the volt ampere equation for a normal PN junction diode and explain its behavior. Discuss the effect of temperature and applied bias on the reverse saturation current.
2. What is Tunnel diode? Explain V-I characteristics of Tunnel diode. Draw and explain the equilibrium energy band diagram of a metal-semiconductor contact where the metal has the smaller work function than semiconductor. Is it a rectifying or an Ohmic contact.
3. What is an enhancement type MOSFET? Explain its construction, working and drain characteristics. Why is it called 'Normally OFF' MOSFET? For a certain D-MOSFET, $I_{DSS} = 10 \text{ mA}$ and $V_{GS(off)} = -8 \text{ V}$
 - i. Is this an n- channel or a p- channel?
 - ii. Calculate I_D at $V_{GS} = -3 \text{ V}$.
 - iii. Calculate I_D at $V_{GS} = +3 \text{ V}$.
4. What is a Charge Coupled Device (CCD)? Explain the working of a CCD with the help of a diagram. Define Non-Volatile Read-Write Memory Give the difference between Erasable Programmable Read Only Memory (EPROM) and Electrically

Erasable Programmable Read Only Memory (EEPROM). Explain one specific example where EPROM and EEPROM are used.

5. What is MEMS? How do you select materials for MEMS devices? Give the differences between 'surface micromachining' and 'bulk micromachining'. Explain briefly the processes of epitaxy and diffusion. Explain with diagram the steps involved in fabrication of a PN junction diode.
6. Discuss with suitable diagram the process of sputtering, and ion implementation for IC fabrication.

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