

- (vii) The emitter current consists of
- a) Carriers passing from collector to emitter b) Carriers passing from base to collector
c) Carriers passing from emitter to base d) None of these
- (viii) The junction capacitance of a p-n diode is used in
- a) Varactor diode b) Photo diode
c) Zener diode d) Tunnel diode
- (ix) The unit of mobility of electrons is
- a) $\text{cm}^2/\text{V}\cdot\text{s}$ b) $\text{cm}/\text{V}\cdot\text{s}$
c) m^2/s d) cm^2/V
- (x) The donor impurities
- a) Generate electrons b) Generate holes
c) Generate hole and electrons d) All of these
- (xi) The reverse saturation current of a PN-junction diode is
- a) Increased with temperature b) Decreased with temperature
c) Inversely proportional with temperature d) Independent of temperature
- (xii) Which of the following doping generates a P-type semiconductor?
- a) Germanium and boron b) Germanium and phosphorus
c) Germanium and antimony d) Silicon and phosphorus
- (xiii) After V_{DS} reaches pinch-off value V_P in a JFET, drain current I_D becomes
- a) Zero b) Low
c) Saturated d) Reversed
- (xiv) The collector and emitter current levels for a transistor with common base dc current gain of 0.99 and base current of $20\mu\text{A}$ are respectively
- a) 2mA and 1.98mA b) $1.98\mu\text{A}$ and 2mA
c) 1.98mA and 2mA d) 2mA and $1.98\mu\text{A}$
- (xv) In saturation region in an n-p-n transistor
- a) V_{CB} is -ve and V_{BE} is +ve b) V_{CB} is +ve and V_{BE} is -ve
c) Both V_{CB} and V_{BE} are +ve d) Both V_{CB} and V_{BE} are -ve

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Draw the circuit symbol of MOSFET. Sketch the structure of an n channel depletion type MOSFET. Draw the typical drain characteristics of it in both enhancement and depletion modes. (3)
3. Estimate the donor concentration in N-type Germanium semiconductor having conductivity $2.016(\Omega\text{m})^{-1}$ and mobility $0.24 \text{ m}^2/\text{Vs}$ (3)
4. In a common emitter n-p-n transistor, $V_{BB}=5\text{V}$, $R_B=100\text{k}\Omega$, $R_C=1\text{k}\Omega$, $V_{CC}=10\text{V}$, $V_{BE}=0.7\text{V}$, $I_{CO}=0$ and $\beta=100$. Find I_B and I_C . (3)
5. Sketch the depletion region before and after pinch-off. (3)
6. Compare between a FET and a BJT. (3)

OR

A BJT is a current controlled device while a FET is a voltage controlled device. Explain. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Draw circuit diagrams for different modes of operation relating to both n-p-n and p-n-p transistor. (5)

8. The transfer characteristic of an n-channel JFET is given, with usual symbols, by $I_{DS} = I_{DSS}(1 - V_{GS}/V_P)^2$ Find an expression for g_m from the above parabolic equation of the transfer characteristic, show how g_m varies with V_{GS} and I_{DS} . (5)
9. Draw the circuit symbol of MOSFET. Sketch the structure of an n channel depletion type MOSFET. Draw the typical drain characteristics of it in both enhancement and depletion modes. (5)
10. What do you mean by effective mass of a current carrier in a semiconductor? Distinguish between drift current and diffusion current (5)
11. Draw I-V characteristics of p-n junction diode. Define cut in voltage. (5)
12. Explain the nature of the typical common-source drain characteristics of a JFET. What is its transfer characteristics? (5)

OR

With a neat sketch, describe the construction of an n-channel JFET. Explain its principle of operation. (5)

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