



UNIT 1: PN Junction diode and Zener Diode

2 MARKS QUESTIONS

SEMICONDUCTORS

1. Classify materials and write the differences between them?
2. What is semiconductor? What are the types of semiconductors?
3. What is doping?
4. What is P type and N type semiconductor?
5. Give examples of Acceptors (Trivalent impurities) and Donors (Pentavalent impurities).
6. What do you mean by generation and recombination of carriers?
7. What is mean life time of charge carriers?
8. Explain the transport phenomena in semiconductors?

PN JUNCTION DIODE

9. Draw the energy band diagram of PN junction.
10. What is PN junction diode? Explain the working of PN junction under forward bias and reverse bias with neat diagram?
11. What is reverse saturation current and explain.
12. Draw the VI characteristics of PN junction diode?
13. What is the effect of temperature on VI characteristics of PN junction diode?
14. Draw the equivalent circuit of a diode in forward bias and reverse bias?
15. What is depletion region and explain how it forms?
16. Differentiate between transition capacitance and diffusion capacitance of PN junction diode.
17. Draw the piecewise linear equivalent circuit of diode and explain it briefly.
18. What is static resistance and dynamic resistance of a diode?
19. Derive the expression for dynamic ac resistance?
20. Give the expression for the current flowing through the diode?
21. What is temperature equivalent voltage? Give the formula?
22. What is n_i , i.e intrinsic carrier concentration for Si and Ge diodes respectively?
23. What is the difference between step graded junction and linear graded junction?
24. What are the applications of PN junction diode?

ZENER DIODE

25. Write the differences between Zener break down and Avalanche break down?
26. What is zener diode? Draw the VI characteristics of Zener diode?
27. What are the applications of Zener diode?
28. Explain how zener diode acts as voltage regulator? And give its limitations?
29. What is Line regulation and Load regulation? Explain how zener diode acts as voltage regulator?

30. What are the differences between PN junction diode and Zener diode?
31. Determine the current flowing in the Ge diode when 0.15V forward bias is applied at room temperature and the reverse saturation current at room temperature is $0.3\mu\text{A}$.
32. Determine the current flowing in the Si diode when 0.6V forward bias is applied at room temperature and the reverse saturation current at room temperature is $10\mu\text{A}$.
33. Determine the current flowing in the Si diode when 0.6V reverse bias is applied at room temperature and the reverse saturation current at room temperature is $10\mu\text{A}$.
- 34. Determine the AC resistance or dynamic resistance for semiconductor with a forward bias of 0.25V and I_0 is $1.2\mu\text{A}$ at room temperature.**
35. Determine the forward bias voltage applied to a silicon diode to cause a current of 20mA and the reverse saturation current $20\mu\text{A}$.
- 36. The diode current is 0.6mA when the applied voltage is 400mV and 20mA when applied voltage is 500mV. Determine η . Assume $kT/q = 25\text{mV}$.**
37. Find the voltage at which the reverse saturation current in Ge PN junction diode attain a value of 90% of its saturation value at room temperature
38. Find the voltage at which the reverse saturation current in Si PN junction diode attain a value of 90% of its saturation value at room temperature
- 39. A Si diode has a saturation current of $7.5\mu\text{A}$ at room temperature 300°K . Calculate the saturation current at 400°K . (hint: convert $^\circ\text{K}$ to $^\circ\text{C}$ i.e $300^\circ\text{K} = 27^\circ\text{C}$, $400^\circ\text{K} = 127^\circ\text{C}$)**
40. A Si diode operates at a forward voltage of 0.4V. Calculate the factor by which the current will be multiplied when temperature is increased from 25°C to 150°C .
41. An ideal Ge PN junction diode has reverse saturation current of $30\mu\text{A}$ at 125°C temperature. Find dynamic resistance for 0.2V bias in (a) Forward direction (b) the reverse direction.
42. The reverse saturation current I_0 in a Ge diode is $6\mu\text{A}$. Calculate the current flowing through the diode when the applied forward voltages are 0.2V, 0.3V and 0.4V at room temperature.

UNIT 2: PN diode applications

2 MARKS QUESTIONS

1. Draw the block diagram of power supply and explain about each block.
2. What is the need of power supply?
3. What is rectifier? Show that PN junction diode acts as a rectifier?
4. Define all parameters rectifiers i.e PIV, average value, rms value, form factor, ripple factor, efficiency, TUF and regulation
5. What are the requirements of a rectifier? Hint: advantages of rectifier.
6. What is PIV of a diode? How do you select a diode based on this in rectifier?
7. What are the advantages and disadvantages of HWR?
8. What are the advantages and disadvantages of FWR?
9. What are the advantages and disadvantages of BR?
10. Compare HWR, FWR, BR.
11. Give the relation between Primary, secondary voltages and its turn ratio?
12. Give the relation between ac rating of secondary and peak voltage.
13. What is the need of filter in power supply?
14. What is the purpose of bleeder resistor in LC or L section filter?
15. What is Critical inductance? Obtain the expression for critical inductance?
16. Explain various types of filters used in power supplies?

UNIT 3: BI POLAR JUNCTION TRANSISTOR

2 MARKS QUESTIONS

1. What is BJT? Define Emitter, Base and Collector?
2. Explain how junctions are formed under open circuited transistor? Explain with neat diagram?
3. Explain the following
 - a. Emitter Efficiency(γ)
 - b. Transport Factor(β^*)
 - c. Large signal Current gain(α_{dc})
4. What is Base spreading resistance?
5. Draw the Eber's and Mole model of BJT?
6. Compare CE, CB and CC configurations?
7. What is Early Effect or Base Width Modulation?
8. What is Punch Through effect?
9. Derive the relation between α , β , γ ?

NUMERICAL PROBLEMS

1. A transistor has $\alpha = 0.98$. If emitter current of the transistor is 1mA, determine base current I_B and gain factor β .
2. Find out α , β and I_E when $I_C = 5\text{mA}$, $I_B = 100\mu\text{A}$.
3. A transistor has $\alpha = 0.99$ and $I_E = 8\text{mA}$ then find I_B .
4. A BJT has $I_B = 10\mu\text{A}$, $I_{CO} = 5\mu\text{A}$ and $\alpha = 0.99$. Determine I_C and I_E .
5. A transistor is connected in CE configuration. Supply voltage $V_{CC} = 10\text{V}$, $R_L = 800\Omega$. Voltage drop across load is 0.8V and current gain $\alpha = 0.96$. Determine V_{CE} and I_B .

UNIT 4: SMALL SIGNAL TRANSISTORS EQUIVALENT CIRCUITS

2 MARKS QUESTIONS

1. Define h-parameters and draw the small signal low frequency h-parameter model of BJT.
2. Draw the CE transistor h-parameter model. Repeat the same for CB and CC.
3. Why h-parameters are preferred to analyse a circuit using BJT.
4. How h-parameters of a transistor are determined experimentally i.e. graphically?
5. Draw the T model of a CE, CB and CC transistors.
6. Draw the Hybrid π model of BJT at low frequencies.
7. Draw the Eber's-Moll model of BJT.
8. Write short notes on Heat sinks.

UJT

1. What is UJT? Draw the symbol, construction diagram and equivalent circuit of UJT?
2. What is Intrinsic standoff ratio(η) ?
3. Explain UJT operation and VI characteristics of the same?
4. What are UJT applications?
5. Draw and explain UJT relaxation oscillator. Derive the expression for frequency of oscillations.
6. A UJT has $R_{BB} = 10\text{K}\Omega$ and $R_{B2} = 3.5\text{K}\Omega$. Find intrinsic standoff ratio.

SCR

1. What is SCR? Draw the symbol, construction diagram and equivalent circuit of SCR?
2. Explain voltage operation of SCR (Gate is open) and VI characteristics of the same?
3. Explain current operation of SCR (Gate is closed) and VI characteristics of the same?
4. What are SCR applications?

DIAC

1. What is DIAC? Draw the symbol, construction diagram and equivalent circuit of DIAC?
2. Explain the operation of DIAC and VI characteristics of the same?
3. What are DIAC applications?

TRIAC

1. What is TRIAC? Draw the symbol, construction diagram and equivalent circuit of TRIAC?
2. Explain the operation of TRIAC and VI characteristics of the same?
3. What are TRIAC applications?

CCD

1. Write short notes on CCD?

UNIT 5: JUNCTION FIELD EFFECT TRANSISTOR

1. What is FET? Classify FET based on their construction?
2. Explain the Field Effect Phenomenon in FET.
3. Prove that the trans conductance $g_m = \frac{2}{V_p} \sqrt{I_D \cdot I_{DSS}}$
4. Explain the biasing for Zero drift current in JFET and prove that $V_p - V_{GS} = 0.628$
5. With a neat sketch plot the characteristics of JFET.
6. What is meant by depletion region in JFET? Explain.
7. What are the differences in BJT and FET?
8. What are the advantages of FET over BJT?
9. Explain DC load line and biasing point concept in FET?
10. Explain about FET self biasing circuit?
11. Define pinch off voltage. Sketch the depletion region before and after pinch off.
12. Sketch and explain the small signal model of JFET.
13. Classify MOSFET?
14. What are the differences between Depletion MOSFET and Enhancement MOSFET?
15. Explain the operation of Enhancement n – channel MOSFET? And draw the drain and transfer characteristics of the same?
16. Explain the operation of Depletion n – channel MOSFET? And draw the drain and transfer characteristics of the same?
17. Explain how BJT acts as a switch?
18. Explain how FET acts as a switch?
19. Explain how MOSFET acts as a switch?
20. Explain how MOSFET acts as a resistor?
21. Mention applications of MOSFET?
22. A JFET has $V_p = -4.5V$, $I_{DSS} = 10mA$ and $I_{Ds} = 2.5mA$. Determine the trans conductance.
23. A JFET has $V_{gsoff} = -6V$, $I_{DSS} = 6mA$ and $I_{Ds} = 4mA$. Determine the values of V_{gs} and V_p .
24. For an n-channel JFET $V_p = -3V$, $I_{DSS} = 8.7mA$ and $V_{gs} = -1V$. Determine the values of I_D , g_{m0} and g_m .