

## Analog Electronics Question

### Diode

1. What is a P-N junction?
2. Why silicon is usually preferred over germanium for fabrication of semiconductor devices.
3. What does the arrowhead represent in a schematic symbol of a P-N junction?
4. How diode acts as a rectifier?
5. In a semiconductor diode P-side is grounded and N-side is applied a potential of  $-3$  V. Will the diode conduct? Explain.
6. What is a junction diode?
7. What is the main difference between the characteristic of a simple switch and those of an ideal diode?
8. Name the two types of reverse breakdowns which occur in a P-N junction diode?
9. Name the breakdown mechanism in a lightly doped P-N junction under reverse biased condition.
10. Name the breakdown mechanism in a heavily doped P-N junction under reverse biased condition.
11. Define Zener breakdown.
12. What is Avalanche breakdown?
13. Clearly distinguish between Zener breakdown and Avalanche Breakdown.
14. What is reverse saturation current?
15. Is reverse saturation current of a junction diode independent of reverse bias voltage?
16. Germanium is more temperature dependent than silicon. Why?
17. What is the effect of temperature on the reverse saturation current of a diode?
18. Explain the effect of temperature on the V-I characteristics of the diode.
19. What is static resistance of a diode?
20. Define dynamic resistance of a P-N junction diode in forward biased condition.
21. Explain what do you understand by the expression "linearization of a nonlinear device".
22. What is step graded junction?
23. What is linear graded junction?
24. Explain why a P-N junction possesses capacitance?
25. What are the two types of capacitances across P-N junction? Which of these is more important in case of forward bias?
26. Differentiate between transition capacitance ( $C_T$ ) and diffusion capacitance ( $C_D$ ) of a P-N junction diode.
27. How does diffusion capacitance  $C_D$  vary with diode current?
28. How does transition capacitance vary with junction voltage in a P-N junction diode?
29. What is the relation between the transition capacitance and reverse bias voltage in a PN diode?
30. What is reverse recovery time?
31. Is 'reverse recovery time' due to majority carriers or the minority carriers?
32. How can the switching speed of a diode be improved?
33. Write down four applications of a diode.
34. Why copper is a good conductor?
35. Classify materials into conductors, semiconductors and insulators.
36. What is the basis for classifying a material as a conductor, semiconductor or a dielectric? What is the conductivity of perfect dielectric?
37. What is Fermi level?
38. Why is silicon more widely used for semiconductor material?
39. What will happen on number of free electrons in a semiconductor on increasing temperature?
40. What is the effect of temperature on conductivity of a semiconductor?
41. What is the conductivity of a perfect dielectric?
42. Why the energy levels of an atom become energy bands in a solid.
43. What is the importance of valence shell and valence electrons?
44. What is the forbidden energy gap? What is its magnitude for Ge and Si?
45. Is hole a fundamental particle in an atom?
46. Define a hole in a semiconductor.
47. What is hole current?
48. Does a hole in a semiconductor contribute to a flow of current? If yes, how and if no, how?
49. What is intrinsic semiconductor?
50. Name any three materials which are most widely used as semiconductors.
51. What type of semiconductor results when silicon is doped with (a) donor impurities (b) acceptor impurities?
52. Which of the two semiconductor materials Si or Ge has larger conductivity at room temperature? Why?
53. Why does a pure semiconductor behave like an insulator at absolute zero temperature?
54. What is the main factor for controlling the thermal generation and recombination?
55. Define mean lifetime of a carrier.

56. In which bands do the movement of electrons and holes take place?
57. What is the mechanism by which conduction takes place inside the semiconductor?
58. What do you mean by mobility of a carrier?
59. What do you mean by drift velocity and mobility of a free electron?
60. Define mobility of a carrier. Show that the mobility constant of electron is larger than that of a hole.
61. Clearly distinguish between conductivity and mobility.
62. What is diffusion current?
63. Define drift current in a semiconductor.  
What is meant by Fermi level in semiconductor? Where does the Fermi level lie in an intrinsic semiconductor?
64. Differentiate between intrinsic and extrinsic semiconductors.
65. Differentiate between N-type and P-type semiconductors.
66. What do you mean by donor and acceptor impurities?
67. What is doping?
68. What is the effect of temperature on extrinsic semiconductors?
69. What are the charge carriers in N-type and P-type semiconductors?
70. For the same order of doping, why does N-type semiconductor exhibit larger conductivity than P-type semiconductor?
71. State law of mass action.
72. Define the term intrinsic concentration.
73. Explain the recombination and trapping process in a semiconductor.
74. Give the continuity equation for electrons.
75. Describe Hall Effect.
76. "Hall effect has played a decisive role in revealing the mechanism of conduction in semiconductors." Explain the statement.
77. What properties of a semiconductor are determined from a Hall Effect?
78. What is Hall coefficient? Where is it used?
79. What do you understand by negative Hall constant?
80. What is a P-N junction?
81. What is potential barrier in a diode? How it gets established?
82. How do the transition region width and contact potential across a P-N junction vary with the applied bias voltage?
83. Which type of charges is present on the two opposite faces of the junction?
84. What types of carriers are present in space charge region?
85. Why space-charge region is called the depletion region?
86. Why an electric field is produced in a depletion region of a P-N junction?
87. What is the cause and effect of the depletion layer in a PN junction diode?
88. The electric field in the space-charge region decreases with forward bias and increases with reverse bias. Why?
89. What is knee voltage?
90. What do you understand by reverse saturation current of a diode?
91. Why is silicon preferred to germanium in the manufacturing of semiconductor devices?
92. Define peak inverse voltage?
93. What is clipper and describe type of clipper.
94. What is clamper and type of clamper?
95. What is meaning of positive clipper and negative clipper?

### Transistor

1. What is a transistor and types of transistors?
2. What is bipolar junction transistor?
3. What is power dissipated by transistor in active region?
4. Why inverse active mode of transistor is not useful?
5. What are the types of transistor configurations?
6. What are  $\alpha$ ,  $\beta$  and  $\gamma$  in a transistor ?
7. What are the values of collector to emitter, Base to emitter saturation, active, cut in, cut off voltages?
8. What is ICBO and ICEO in a transistor what is relation between ICEO, ICBO and ICO?
9. Why ICBO is greater than ICO?
10. What are the different regions of operation of transistor?
11. What is Ebers model of transistor?
12. How to obtain response of transistor to large signal and small signals?
13. Draw Small signal hybrid model of transistor?
14. Define Transconductance of a transistor?
15. Small signal PI model of transistor?
16. Small signal T model of transistor?

17. What is Q point?
18. What is self bias (or) voltage divide bias circuit of transistor?
19. What is fixed bias?
20. Define stability factors of a transistor operated at Q-Point?
21. What is thermal resistance of a transistor?
22. What is the relation between large signal current gain (or) DC current gain and small signal beta?
23. Why two back to back diodes cannot function as a transistor?
24. What is signification of emitter degeneration resistance?
25. What is significance of emitter bypass capacitor an input output blocking capacitors?

### Oscillator

1. Describe the function of oscillator or tank circuit?
2. Is oscillator is a energy converter circuit, True or false.
3. Which type of feedback circuit is used in oscillator circuit?
4. Explain the term damped oscillation and undamped oscillation?
5. Why the amplitude of damped oscillation is decreasing?
6. What is Barkhausen criteria?
7. Describe the significance of Barkhausen Criteria?
8. What are the essential conditions to produce oscillation?
9. Describe the name of different type of oscillator?
10. Describe the working R-C phase shift of oscillator?
11. Describe the advantage of R-C phase shift of oscillator?
12. In which type of oscillator both positive and negative feedback are used?
13. What are the limitations of LC and RC oscillator?

### Feedback amplifier

1. What is the effect on input and output impedance of an amplifier if it employs voltage series negative feedback?
2. Define 'feedback factor' of a feedback amplifier.
3. List the four basic feedback topologies.
4. List the characteristics of an amplifier which are modified by negative feedback.
5. What happens to the input resistance based on the type of feedback in an amplifier?
6. Define transconductance and transresistance amplifiers.

### Op-Amp

1. Why OPAMP is called operational amplifier?
2. What is CMRR?
3. Define slew rate?
4. What is characteristic of Ideal OPAMP?
5. What is Amplifier?
6. What is the Formula for Non Inverting Amplifier?
7. What is perfect balance in OPAMP?
8. Which OPAMP don't have feedback loop?
9. Why OPAMP called direct coupled high differential circuit?
10. Why OPAMP called operational Amplifier?
11. What is the output Differentiator and Integrator?
12. Explain adder or summing amplifier?
13. What is integrator? What is the application of integrator?
14. Op-Amp is mostly used as integrator than differentiator, Explain Why?
15. Which Op-Amp does not have feedback loop?

### JFET & MOSFET

1. What is the major difference between a bipolar and a unipolar device ?
2. Explain why BJTs are called bipolar devices while FETs are called unipolar devices.
3. Define "current-controlled device" and "voltage-controlled device".
4. Why is terminology "field effect" appropriate for this terminal device ?
5. Why  $I_G$  is effectively zero ampere for a JFET transistor ?
6. What do you understand by terms channel and drain in JFET ?
7. Why the channel of a JFET is never completely closed at the drain end ?
8. How is drain current controlled in a JFET?
9. What is meant by drain characteristic of FETs?
10. 10. What happens to the drain current of a P-channel JFET when a positive voltage is applied on its gate?
11. 11. What is meant by transfer characteristic of FETs?
12. 12. Define pinch-off voltage for a JFET.

14. What are the parameters that control the pinch-off voltage of JFET?
15. Why FET is called the voltage controlled device?
16. What is meant by gate-source cutoff voltage?
17. What is meant by saturation region?
18. What is meant by drain-source saturation current  $I_{DSS}$ ?
19. What is physical significance of high input impedance of an FET?
20. What is dynamic resistance of a JFET?
21. What is meant by transconductance with reference to JFET?
22. In practice, the voltage divider bias is less effective with JFET than BJT. Why?
23. Why is CS JFET amplifier most widely used?
24. Give features and applications of CS amplifier.
25. Why common drain (CD) amplifier is called a source follower?
26. Give features of CD JFET amplifier.
27. Give features CG JFET amplifier.
28. What is the basic difference between JFET and MOSFET?
29. Why is MOSFET called sometimes IGFET?
30. Write the types of MOSFET and their two major differences.
31. In the linear region operation of MOSFET drain current decreases as the temperature increases. Explain.
32. What is meant by threshold voltage?
33. Why MOSFETs are never connected or disconnected in the circuit when power is ON?
34. Name the factors which make the JFET superior to BJT?
35. Why enhancement mode MOSFETs are preferred over the depletion mode ones in the fabrication of IC?
36. In communication electronics, why JFET RF amplifier is used in a receiver instead of BJT amplifier ?