DRONACHARYA GROUP OF INSTITUTIONS, GREATER NOIDA

Question bank

SEM: 3th Class: ECE

SUBJECT: **Fundamental of Electronic Devices**

COURSE CODE: NEC-302

1. Differentiate between crystalline and amorphous solids.
2. Calculate APF of SC, FCC and BCC.
3. Obtain the volume density of Si atoms with lattice constant of 5.3 A^0
4. What is miller Indices.
5. Find the miller indices of a set of parallel planes which make intercepts in the ratio 4a on x and y axis and are parallel to z axis, a, b and c being primitive vectors of the lattice.
6. Differentiate between Diamond and Zinc Blende structure and also obtain the APF of Diamond.
7. Differentiate between Direct and Indirect semiconductor.
8. Explain various types of bonding.
9. Explain energy band diagram in crystal with suitable diagram.
10. Calculate the density of copper when the atomic radius 1.2 A^0
11. Obtain the volume density of Si atoms with lattice constant of 5.3 A^0
12. In a crystal whose primitives are 1.2 A^0 ,1.8A^0 and 2 A^0 a plane(231)

    cuts an intercept 1.2 A^0 On axis. Find the corresponding intercepts on the y axis and z axis.
13. Find the miller indices of a set of parallel planes which make intercepts in the ratio 4a on x and y axis and are parallel to z axis, a, b and c being primitive vectors of the lattice.
14. Explain why holes are found at the top of the balance band whereas electrons are found at bottom at the bottom of valance band.
15. Show the (643) plane and [643] direction in a cubic crystal lattice.
16. Obtain the volume density of Si atoms with lattice constant of 8.3 A^0.

17. Consider a particular material with Fermi energy of 6.25ev and that the electrons in the material fallow the Fermi dirac distribution. Calculate the temperature at which there is 1% probability that a state0.3 ev below the Fermi energy level will not contain an electron.
18. Photoconductivity and electroluminescence.
19. What are different modes of operation in BJT.
20. What Pinch off voltage.
21. Define Tunnelling phenomenon.
22. Why E-MOSFET is known as OFF device.
23. What is Zener Diode?
24. Give the expression for current gain for CE, CB, CC configurations.
25. What is the forward and reverse bias of a p-n junction?
26. Give the applications of LED.
27. What is SCR?
28. Explain the working of enhancement-MOSFET in detail. Give difference between e-MOSFET and d-MOSFET.
29. Explain the cathode and electro luminescence.
30. Explain the reverse recovery time of a pn junction.
31. Give difference between the FET and BJT.
32. Explain hole capture and electron capture in detail.
33. Explain direct recombination of electrons and holes in detail.
34. Explain Hall Effect in detail and derive the mathematical expression for Hall Voltage. List some applications of Hall effect .
35. What is carrier life time?
36. why does direct recombination life time differ from indirect recombination life time
37. Explain the working of transit time device or IMPATT Diode.
38. Explain with energy band diagram the behaviour of electron and hole concentration at thermal equilibrium for intrinsic, n-type and p-type semiconductor.
39. Explain the working of Tunnel Diode with tunnelling in detail. What are its application

40. Explain how LASER works in detail. Give its advantages over LED. Mention its applications.

41. Explain the construction and working of n-p-n bipolar junction transistor with all necessary diagrams.

42. What is Fermi level, give the expression for it . Explain with diagram how Fermi dirac distribution function behave in intrinsic, n-type and p-type semiconductor.

43. Explain in detail Schottky barrier on N-type semiconductor.

44. Derive the expression for diffusion or storage capacitance. Transition capacitance of an abrupt junction diode is 20pF at 5 V. Compute the decrease in capacitance for 1V increase in bias.

45. Give in detail in p-n-p-n Diode works. What are its applications.

46. Explain how Diac and Triac works.

47. Derive the mathematical expression for electron and hole concentration at equilibrium for intrinsic and extrinsic type semiconductor.

48. Explain Zener Breakdown.

49. Expain Avalanche Breakdown.

50. Give the difference stimulated emission and spontaneous emission.

51. Explain the working of JFET in detail.

52. Derive the expression for current density in extrinsic type semiconductor (n-types and p-type). Differentiate between drift current and diffusion current.

53. Discuss the switching characteristics of a transistor for a pulse input.

54. Explain rectifying contact ?State the condition for which the junction between a metal and n type semiconductor will work as a rectifying contact.Draw the energy band diagram of a rectifying contact formed between a metal and n-type semiconductor at equilibrium condition.

55. Explain the current component in a pn junction diode and give its quantitative value.

56. What is the forward and reverse bias of a pn junction explain.

57. What is the zener and avalanche breakdown and explain tunnelling.

58. Find the reverse saturation current density in an abrupt silicon junction with the following data: $N_d=10^{21}/m^3$,$N_a=10^{22}/m^3$,$D_n=3.4x10^{-3}m^2/sec$,$D_p=1.2x10^{-3}$ m^2/sec,$L_n=7.1x10^{-4}m$,$L_p=3.5x10^{-4}m$ and $n_i=1.6x10^{16}/m^3$

59. What will be the value of contact potential of an abrupt junction at room temp of intrinsic concentration $n_i=1.5x10^{16}/m^3$ with doping level of $N_d=N_a=10^{21}/m^{3.}$

60. Derive an expression of a built in potential in terms of the doping level and intrinsic concentration.

61. Explain the cathode and electro luminescence.

62. Find the diffusion coefficient of electrons and holes of a silicon single crystal at 300K if the mobilities of electron and holes are 0.17 and 0.025 $M^2V^{-1}S^{-1}$,respectively.

63. Explain the diffusion and transition capacitance of a pn junction and show that the transition capacitance is given by the expression $C_t=\varepsilon A/W$

64. Explain the schottky barrier.

65. Explain the reverse recovery time of a pn junction.

66. What is Hall Effect and hall angle derive an expression for the hall angle.

67. What do you mean by reverse recovery transient? Explain the reverse recovery time of a pn junction.

68. Explain the schottky barrier.

69. Show that the transition capacitance of a pn junction is $C_t=\varepsilon A/W$

70. Explain the diffusion and transition capacitance of a pn junction

71. What do you mean by rectifying contact ?State the condition for which the junction between a metal and n type semiconductor will work as a rectifying contact. Draw the energy band diagram of a rectifying contact formed between a metal and n-type semiconductor at equilibrium condition.

72. Show that a built in potential of a pn junction can approximately be given by $V_0=(KT/q)\log_e(NaN_d/n_i^2)$

73. Obtain the value of contact potential of an abrupt junction at room temp of intrinsic concentration $n_i=1.5x10^{16}/m^3$ with doping level of $N_d=N_a=10^{21}/m^3$

74. Find the reverse saturation current density in an abrupt silicon junction with the following data: $N_d=10^{21}/m^3$,$N_a=10^{22}/m^3$,$D_n=3.4x10^{-3}m^2/sec$,$D_p=1.2x10^{-3}$ m^2/sec,$L_n=7.1x10^{-4}m$,$L_p=3.5x10^{-4}m$ and $n_i=1.6x10^{16}/m^3$

75. Explain the zener and avalanche breakdown and explain tunnelling.

76. What do you mean by forward and reverse bias of a junction?Give quantitative description of current flow at a junction of a pn junction diode..

77. Find the diffusion coefficient of electrons and holes of a silicon single crystal at 300K if the mobilities of electron and holes are 0.17 and 0.025 $M^2V^{-1}S^{-1}$respectively.

78. What is luminescence?

79. Explain the working of N-channel MOSFET. What is the difference between enhancement and depletion mode of operation.
80. Sketch and explain the basic structure of an N channel junction field effect transistor.
81. What are the advantages and disadvantages of JFET over BJT?
82. Why is FET known as a unipolar device?
83. Draw and explain the small signal low frequency model of JFET.
84. Draw and explain the transfer curve of MOSFET in enhancement mode.
85. Distinguish between JFET and MOSFET.
86. How do you protect the MOSFET gate?
87. Describe the various FET parameters.
88. What are the advantages of FET
89. Explain the operation of JFET.
90. Derive MOSFET and explain its enhancement?
91. Why FET is called as voltage controlled device?
92. Define the channel width of JFET.
93. Define Base spreading resistance.
94. Write the advantages of N channel MOSFET over P channel MOSFET.
95. Write the characteristics of JFET.
96. What is pinch off voltage?
97. What are the advantage of MOSFET compared to JFET?
98. What are the two modes of MOSFET?
    (a) Depletion mode (b) Enhancement mode
99. What are the differences between JFET & BJT.
100. What is amplification factor? It is the product of drain resistnce and transconductance m=Rd x gm Rd=Drain resistnce gm=Transconductance