Anekant Education Society's

Tuljaram Chaturchand Collegeof Arts, Science and Commerce, Baramati

DEPARTMENT OF PHYSICS

M.Sc. I Sem II PHY- 4204 Physics of Semiconductor Devices

(QUESTION BANK)

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1. What is semiconductor? How they differ from metals and insulators? What are their characteristic properties?
2. What is semiconductor? How they differ from conductors? Why an increase in temperature decreases the resistivity of semiconductor
3. Why an increase in temperature of semiconductor increases the conductivity?
4. Explain the terms intrinsic semiconductor
5. Explain the terms extrinsic semiconductor
6. Explain the terms charge carriers
7. Explain the terms effective mass
8. What is impurity conduction in semiconductors?
9. Explain how the presence of small impurity in a semiconductor modify its conduction properties
10. Define the terms electron hole pair. Give example of each with suitable materials
11. Define the terms Donar acceptor. Give example of each with suitable materials
12. Describe N-type semiconductors with band diagram
13. Describe P-type semiconductors with band diagram
14. What are extrinsic semiconductor? How can they be formed?
15. At high temperature an extrinsic semiconductors behaves like an intrinsic one, why?
16. On the basis of band structure how solids are classified?
17. What are the function of donor and acceptor impurities?
18. What are the compound semiconductor?
19. What is hole?
20. What are donars and acceptors?
21. What is band gap?
22. What are semiconductors?
23. Compare the variation of conductivities with temperature in metals and semiconductors?
24. What Is intrinsic semiconductors? give examples

25. What Is extrinsic semiconductors? give examples
26. How n-type and p-type semiconductors are produced?
27. What is the difference between hole current and electron flow
28. Compare the variation of conductivities with temperature in metals and semiconductors
29. Explain the term depletion layer across a p-n junction.
30. Obtain the expression for the width of the depletion layer in terms of the impurity concentration and barrier potential.
31. Explain how a semiconductor diode can be used as a rectifier
32. Discuss the operation of p-n junction diode
33. Explain the working of p-n junction.
34. Discuss forward and reverse biasing of p-n junction diode
35. Explain I-V characteristic of P-N junction
36. Show that Fermi energy in case of intrinsic semiconductor lies between the conduction and valance band under thermal equilibrium
37. Draw the energy band diagram of an abrupt p-n junction under thermal equilibrium
38. Draw the energy band diagram of an abrupt p-n junction under forward bias
39. Draw the energy band diagram of an abrupt p-n junction under reverse bias
40. Derive an expression for diffusion capacitance of p-n junction under low frequence condition
41. Compare between zener break down and avalanche multiplication phenomenon
42. Using energy band diagram for n-p-n bipolar junction transistor under common base configuration obtain the approximate expression for
    a. Emitter injection efficiency
    b. Base transport factor
43. Obtain the relation between breakdown voltages of n-p-n transistor under common base and common emitter configuration
44. Explain the switching action of transistor operating in common emitter configuration
45. Derive an expression for the drain current on junction field effect transistor (JFET)
46. Compare field effect transistor (FET) and bipolar junction bipolar junction transistor (BJT)

47. Draw a neat representation of energy band diagram of metal with p-type semiconductor contacts under
    a. Thermal equilibrium
    b. Forward bias and
    c. Reverse bias
48. Describe any one known method to measure the barrier heights of metal semiconductor contact
49. Draw a neat representation of energy band diagram of metal with n-type semiconductor contacts under
    a. Thermal equilibrium
    b. Forward bias and
50. Reverse bias
51. Derive an expression for the diffusion current density
52. Derive an expression of maximum electric field of the linearly graded junction
53. Derive an expression of maximum diffusion capacitance of the linearly graded junction
54. Use Poisson's equation and derive built in potential of JFET
55. Write a note on narrow base diode
56. Explain switching mechanism of BJT
57. Define generation and recombination current density
58. Find the total forward current density what is the pinch off and saturation mechanism of JFET?
59. Draw characteristic of power transistor
60. Explain the avalanche and second break down of the power transistor?
61. Discuss different interface states of metal semiconductor contact
62. State the assumption of thermionic emission theory of metal semiconductor contact and find the equation of total current density
63. What is IMPATT diode?
64. Describe the avalanche and drift region of the IMPATT diode
65. Explain the construction and I-V characteristic of SCR.
66. Describe the triggering mechanism occurs in SCR?
67. What is Schottky barrier?

68. Compare the rectifying and ohmic contact?
69. What is hall effect?
70. Find the hall mobility of semiconducting sample
71. What is meant by excess carrier?
72. How can we create excess carriers in semiconductors
73. What are the effect of temperature and doping on the mobility of carriers
74. What is the role of tunneling and avalanche multiplication in the junction breakdown
75. What is the second break down phenomenon in power transistor
76. Explain the high injection condition under the forward state
77. Define Emitter injection efficiency
78. Define Base transport factor
79. Define Common base current gain
80. Define Common emitter current gain of n-p-n transistor
81. What is Krick effect
82. Define generation, recombination and life time of carriers.
83. Draw I-V characteristic of practical diode indication
84. Define generation recombination current region
85. Define diffusion current region
86. Define high injection region and
87. Define series resistance effect and reverse leakage current
88. Distinguish between direct band gap and indirect band gap semiconducting materials
89. Draw suitable energy band diagram of p=n junction reverse bias and explain zener break down phenomenon
90. With the help of suitable diagram explain transistor action and derive an expression for basis parameter for any bipolar junction transistor.
91. Explain static and transfer characteristic of junction field effect transistor (JFET)
92. Explain the switching characteristic of transistor
93. Compare the schottky diode with p-n junction
94. Explain diffusion theory of metal semiconductor contact
95. Show that intrinsic carrier density depends on the band gap of semiconductor under thermal equilibrium

96. What are drift and diffusion currents derive an expression for total current density
97. Define Emitter injection efficiency of n-p-n bipolar transistor
98. Define Common-emitter current gain of n-p-n bipolar transistor
99. Define Base transport factor of n-p-n bipolar transistor
100. Define Common-emitter current gain of n-p-n bipolar transistor
101. Obtain the relation between breakdown voltages foe an n-p-n transistor biased in common base and common emitter configuration
102. Explain the working of field effect transistor