QUESTION BANK IN PHYSICS (B.TECH FIRST YEAR)

SUPERCONDUCTIVITY

1. Explain Meissner effect, type-I and type-II superconductors. (4) {JUN 15 [GNE]}
2. What is isotope effect? (2) {JUN 15 [PTU]}
3. Give a brief account of BCS theory of superconductivity. (3) {JUN 15 [PTU]}
4. Give a brief account of occurrence of superconductivity using BCS theory. (3) {JUN 15 [PTU]}
5. What is the wavelength of an electromagnetic photon, which can break a Cooper pair in a material having critical temperature of 4K? (2) {Dec 14 [GNE]}
6. Derive London's equations and give their significance.(4) {Dec 14 [GNE]}
7. Derive London's equations and show that these equations can account for perfect diamagnetism property of an ideal superconductor. (4) {JUN 14 [GNE]}
8. What is the effect of magnetic field on superconductivity? Given a type-I superconductor with $T_C = 7K$ and slope $\frac{dH_C}{dt} = -5\times10^{-4}\,A/m$ at T_C. Estimate its critical field at 6K. (4) {JUN 14 [GNE]}
9. What do you mean by Meissner effect? (2) {JUN 14 [PTU]}
10. A superconducting state behaves according to which type of magnetic material in presence of applied magnetic field having magnitude less than critical value. (2) {JUN 14 [PTU]}
11. What do you understand by superconducting state? Under what conditions one can achieve it? (4) {Dec 2013 [PTU]}
12. Why are type I superconductors poor current carrying conductors? (2) {Dec 2013 [PTU]}
13. What is Meissner effect? (2) {Dec 2013 [PTU]}
14. Derive London equation and discuss how its solution led to Meissner effect. (4) {Dec 2013 [PTU]}
15. The penetration depth of mercury at $3\cdot5K$ is about $750\,\mathring{A}$. What will be the penetration depth at 0K, if the critical temperature for mercury is $4\cdot2K$? (4) {Dec 2013 [PTU]}
16. Enumerate the factors affecting superconductivity. (2) {Dec 2013 [GNE]}
17. The critical magnetic field for a superconductor at absolute zero is $9\times10^4\,Am^{-1}$ and at 6K is $5\times10^4\,Am^{-1}$. Find the critical temperature and energy required to break Cooper pair at absolute zero. (4) {Dec 2013 [GNE]}
18. Derive London's equations and hence explain Meissner's effect and flux penetration. (4) {Dec 2013 [GNE]}
19. What is Cooper pair? (2) {Jun 2013 [GNE]}
20. Deduce London equations and define London penetration depth. (4) {Jun 2013 [GNE]}
21. What is Meissner Effect? Explain type-I and type-II superconductors. (4) {Dec 2012 [GNE]}
22. For a specimen of V_3Ga, the critical fields are $1\cdot4\times10^5$ A/m & $4\cdot2\times10^5$ A/m at 14K and 13K respectively. Calculate the transition temperature and critical fields at 0K and $4\cdot2K$. (2) {Dec 2012 [GNE]}
23. Outline some experimental facts about superconductivity. (4) {Dec 2012}

24. What arte type-II superconductors? (2) {June 2012}
25. What is the physical phenomenon behind superconductivity? How successful is this in today's context? (4) {June 2012}
26. Elaborate the main features of BCS theory. (4) {June 2012}
27. What are important features of BCS theory? (2) {Dec 2011}
28. What is the physical mechanism behind Meissner Effect? (3) {Dec 2011}
29. Discuss London's theory of superconductivity. (5) {Dec 2011}
30. What are the conditions for a material to be superconductor? (2) {June 2011}
31. Explain BCS theory of superconductivity. (4) {June 2011}
32. What are London Equations? Find the expression for penetration depth of a superconductor. (4) {June 2011}
33. What is Meissner Effect? (2) {Dec 2010}
34. Explain the difference between type-I and type-II superconductors. (3) {Dec 2010}
35. Give the salient features of BCS theory of superconductors. (3) {Dec 2010}
36. Superconductors are perfectly diamagnetic. Explain. (2) {Dec 2010}
37. What is Cooper pair? (2) {June 2010}
38. Discuss the important differences between type-I and type-II superconductors with the help of example and plots of magnetization (M) Vs magnetic field (H). (3) {June 2010}
39. What is Meissner Effect? Further explain the effect of magnetic field on the superconducting state. (3) {June 2010}
40. Define London Penetration depth and write its expression. (2) {June 2010}
41. Draw graphs for hard and soft superconductors. (2) {Dec 2009}
42. Explain BCS theory of superconductivity. (5) {Dec 2009}
43. Write down the relation between critical field and critical temperature in superconductors. (2) {June 2009}
44. Plot the graphs for type-I and type-II superconductors. (2) {June 2009}
45. Derive & explain the London equations and calculate the expression for the Penetration Depth. (8) {June 2009}
46. What do you mean by field penetration in the superconductors? (2) {Dec 2008}
47. What do you mean by coherence length in context with superconductors? (2) {Dec 2008}
48. Define Levitation effect and explain the various factors that can destroy the superconductivity. (4) {Dec 2008}
49. Explain the BCS theory of superconductivity. (4)
50. Why superconductors are perfectly diamagnetic in nature? (2) {May 2008}
51. What is critical field? Write down the expression for H_c and differentiate between type-I and type-II superconductors. (4) {May 2008}
52. Derive first London's equation and give its physical significance. (4) {May 2008}
53. State Meissner effect of superconductivity. (2) {Dec 2007}
54. What is London's penetration depth? How does it vary with temperature? (4) {Dec 2007}
55. Define Cooper Pair. Calculate the wavelength of a photon, which will be required to break a Cooper Pair in a superconductor (Zr) for which $T_C = 0 \cdot 56K$. (4) {Dec 2007}

56. Write the formula for variation of magnetic field intensity with temperature. (2) {May 2007}
57. What is superconductivity? What are the differences between type-I and type-II superconductors? A type-I superconductor with $T_C = 7K$ has slope $\frac{dB_C}{dT} = -25mTK^{-1}$ at T_C. Estimate its critical field at 6K. (8) {May 2007}
58. What are Cooper Pairs? (2) {Dec 2006}
59. What are type I and type II superconductors? Explain. (3) {Dec 2006}
60. For Hg (mercury), the critical temperature at which the superconductivity ensues with zero applied magnetic fields is $4 \cdot 15K$. The critical applied magnetic field at which superconductivity will not take place at any temperature is $0 \cdot 041T$. Find the applied magnetic field that will stop the superconductivity at $2 \cdot 2K$. (3) {Dec 2006}
61. What is Meissner Effect? (2) {May 2006}
62. What do you understand by type-I and type-II superconductors? (6) {May 2006}
63. Discuss London's theory of superconductivity. (2) {May 2006}
64. What are Cooper pairs? (2) {Dec2005}
65. What do you understand by type-I and type-II superconductors? Give BCS theory of superconductivity. (8)
66. What is the effect of magnetic field on superconductivity? (2) {May 2005}
67. What is Meissner Effect? Show how London equations lead to this effect. (1,4) {May 2005}
68. A type-I superconductor with $T_C = 7K$ has slope $\frac{dB_C}{dT} = -25mTK^{-1}$ at T_C. Estimate its critical field at 6K. (3) {May 2005}
69. What is Meissner effect? (2) {Dec 2004}
70. What is superconductivity? What are the differences between type-I and type-II superconductors? A type-I superconductor with $T_C = 7K$ has slope $\frac{dB_C}{dT} = -25mTK^{-1}$ at T_C. Estimate its critical field at 6K. (2,3,3) {Dec 2004}
71. Metals, which are very good conductors at normal temperatures do not show superconducting behaviour. Why? (2) {May 2004}
72. Distinguish between type-I and type-II superconductors. Briefly discuss the BCS theory of superconductivity. (5) {May 2004}
73. State and explain Meissner Effect. How do London equations account for this effect? (3) {May 2004}
74. What are Cooper pairs? (2) {Dec2003}