12-12-17

DOON UNIVERSITY, DEHRADUN

End Semester Examination, Second Semester, 2017-18

School of Physical Sciences

MSc Physics (Optoelectronics)

Course: PHC-501: Advanced Solid State Physics

Time Allowed: 3Hours *Maximum Marks: 50*

Note: Attempt All Questions from Sections A, B, C.

SECTION: A *(Marks: 10 X 2 =20)*

1. In III-V compounds, will Si act as a donor or acceptor? Explain
2. Which of the following materials is not a semiconductor?
   (a) Silicone (b) Germanium (c) Gallium Arsenide (d) Gallium Nitride
3. The conduction band of a semiconductor material may be
   (a) completely filled (b) partially filled (c) empty (d) b or c.
4. Calculate the lande-g factor for Zn^{2+} and Fe^{3+}.
5. What are high temperature superconductors? Give an example.
6. The effective diameter of Copper pair is_____.
7. The critical temperature T_c for Hg with isotopic mass 199.5 is 4.185K. Calculate the critical temperature when its isotopic mass changes to 203.4
8. The maximum possible decrease in energy during grain growth in Cu (grain boundary energy = 0.5 J/m^2) of initial grain diameter of 0.3 mm is_____
9. A cation vacancy and an anion vacancy in a crystal of the type AB is called_____
10. (i)Fluorescence occurs within _____s. (ii) What are excitons?

SECTION: B *(Marks: 4 X5=20)*

11. Why superconductivity occurs in certain material? Explain.
12. Describe Meissner effect. What are type II superconductors. Explain the concept of high critical field in these superconductors?
13. Why four probe method is used? Explain in detail. Why it is better than two probe method?
14. What do you mean by London penetration depth? The penetration depth of mercury at 3.5 K is about 75.0 nm. Estimate the penetration depth at 0K. T_c for Hg is 4.12 K.
15. (i)What are colour centres?? Discuss the model of F- centres?
    (ii) Classify the Imperfections according to their dimensions.

SECTION: C *(Marks: 5 X 2=10)*

16. What are the postulates of quantum theory of paramagnetism? By considering these postulates, derive the value for susceptibility in these materials?
17. What do you understand by Josephson effect? What is the role of tunnelling in Josephson effect? How does this effect is being applied in SQUID?