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**DOON UNIVERSITY, DEHRADUN**  
**End Semester Examination, Second Semester, 2016-17**

**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. In p-type materials, minority carriers would be \_\_\_\_\_.
4. The conduction band of a semiconductor material may be  
(a) completely filled (b) partially filled (c) empty (d) b or c
5. Basic source of magnetism  
(a) Charged particles alone (b) movement of charged particles (c) magnetic dipoles  
(d) magnetic domains
6. What are magnetic domains?
7. The critical temperature for Hg is \_\_\_\_\_
8. The effective diameter of Copper pair is \_\_\_\_\_
9. 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
10. What do you understand by critical magnetic field?

**SECTION: B**

*(Marks: 5 X 4 = 20)*

5. Describe and discuss BCS theory of superconductivity.
6. Describe Meissner effect. Distinguish between type I and type II superconductors.
7. Differentiate between Hall effect and Quantum Hall Effect.
8. 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.

**SECTION: C**

*(Marks: 5 X 2 = 10)*

9. Distinguish between the characteristics features of diamagnetism, paramagnetism, ferrimagnetism, antiferromagnetism. Give an example of each type of material. Comment on the temperature variation of susceptibility for all types of materials.
10. 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?