



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION – PHYSICS**

**FOURTH SEMESTER – APRIL 2016**

**PH 4806 - SOLID STATE PHYSICS – II**

**(UPTO 11<sup>TH</sup> BATCH)**

Date: 15-04-2016  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**SECTION- A**

Answer **all** the questions.

**10 x 2 = 20 Marks**

1. Intrinsic semiconductor behaves like an insulator at absolute zero? Justify.
2. State the law of mass action.
3. Explain the terms anti-ferro electricity and ferri-electricity.
4. What is the implication of a complex electronic susceptibility?
5. What are colour centres and name the various types of colour centres?
6. What is photoluminescence?
7. What are ferrites? Mention any two uses of them.
8. Mention the different sources of permanent magnetic moment in atoms.
9. Mention any two High- $T_c$  materials and their advantage.
10. What are type I and type II superconductors?

**SECTION- B**

Answer any **four** questions.

**4 x 7.5 = 30 Marks**

11. Explain Hall effect and derive an expression for Hall coefficient for a semiconductor based on two band model of charge carriers.
12. Derive Clausius-Mossotti equation for a dielectric.
13. What is population inversion, describe any three pumping techniques?
14. Describe the classical theory of diamagnetism.
15. Derive an expression for London's penetration depth.

**SECTION- C**

Answer any **four** questions.

**4 x 12.5 = 50 Marks**

16. For a n-p semiconductor, derive an expression for the product term  $np$  where  $n$  and  $p$  are electron and hole concentrations respectively.
17. Derive an expression for frequency dependent dielectric constant and hence explain anomalous dispersion.
18. Write a short note on various optical absorption processes.
19. Outline the quantum theory of paramagnetism and hence establish Curie law.
20. Explain with necessary theory (i) flux quantisation, (ii) AC Josephson effect and (iii) DC Josephson effect.

**( 6 + 4+ 2.5 Marks)**

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