 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **PHYSICS**

FOURTH SEMESTER – APRIL 2012

# PH 4806 - SOLID STATE PHYSICS - II

Date : 16-04-2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**PART - A**

Answer **ALL** questions: (10x2=20)

1. What are direct and indirect band semiconductors ?

2. Show that n0 p0 is independent of the position of the Fermi level.

3. Establish the relation between relative permeability and magnetic susceptibility.

4. Evaluate Lande's g factor for S=0.

5. What is pyroelectric effect?

6. What is photoconductivity?

7. Explain ferri-electricity.

8. What is the working principle of a Maser?

9. Mention the three critical parameters of a super conductor.

10. Explain isotope effect in superconductivity.

**PART - B**

Answer any **FOUR** questions: (4x7.5 = 30)

11. Explain the effect of temperature on the mobility of charge carriers in a semiconductor.

12. Give the classical theory of electronic polarisation.

13. Explain the phenomenon of absorption in semiconductors and the role of excitons.

14. Derive an expression for anti ferro magnetic susceptibility.

15. Write a short note on high temperature superconductivity.

**PART - C**

Answer any **FOUR** questions : (4x12.5 =50)

16. (a) Explain with suitable energy level diagrams the rectifying effect at a metal semiconductor junction. (8.5)

(b). Calculate the intrinsic conductivity σi at 300K for germanium. Given μe and μp are 0.39 and 0.19 m2v-1s-1 , Eg is 0.72eV and C is 4.8 x10 21 (4)

17. (a) Derive an expression for the local field in a dielectric.

(b) Establish the Clausius-Mossotti equation. (5)

18 . (a) Explain the phenomenon of photoluminiscence. (5)

(b) Deriveexpressions for Einstein coefficients of stimulated emission**.**

19. (a) Explain classical theory of dia-magnetism.

(b) What are ferrites? Give any two examples. (4)

20. Briefly outline the BCS theory of superconductivity and derive an approximate expression for the transition temperature.