STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2019 – 2020 and thereafter)

M.Sc., DEGREE EXAMINATION NOVEMBER 2023
PHYSICS
THIRD SEMESTER

COURSE : CORE
PAPER : SOLID STATE PHYSICS
SUBJECT CODE : 19PH/PC/SS34
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION - A

ANSWER ALL QUESTIONS: **(10x3=30)**

1. Explain band gap of materials.
2. What is an intrinsic semiconductors Give examples.
3. Explain the construction of Fermi surfaces.
4. Write briefly about electronic polarizability.
5. Briefly explain diamagnetism.
6. State Hund's rule.
7. What are magnons?
8. What is meant by anisotropy energy in ferromagnetic material?
9. Explain Meissner effect.
10. Write a note on SQUID.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5x5=25)**

11. Obtain an expression for the carrier concentration of an intrinsic semiconductor.
12. Explain local electric field of an atom.
13. Discuss the adiabatic demagnetisation in paramagnetic salts.
14. How does exchange integral contribute to ferromagnetic order in materials? Explain.
15. Distinguish between Type I and Type II superconductors.
16. Discuss the thermoelectric effects in semiconductors.
17. Explain the BCS theory of superconductors.

SECTION – C

ANSWER ANY THREE QUESTIONS: **(3x15=45)**

18. Explain the Kronig-Penney model for the motion of an electron in a periodic potential.
19. Deduce Clausius-Mosotti equation to determine the dipole moment of a polar molecule from the dielectric constant measurements.
20. Discuss the quantum theory of paramagnetism and obtain an expression for paramagnetic susceptibility. Discuss how the theory explains the behaviour of rare earth ions.
21. Explain in detail the concept of ferromagnetic domains. Show how the hysteresis curve is explained on the basis of domain theory.
22. What is Josephson tunnelling? Explain AC and DC Josephson effects in detail.

****