STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-2012 & thereafter)

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SUBJECT CODE : 11PH/MC/SS54

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B.Sc. DEGREE EXAMINATION NOVEMBER 2014
BRANCH III - PHYSICS
FIFTH SEMESTER

REG. No._____

COURSE	**:**	**MAJOR – CORE**
PAPER	**:**	**SOLID STATE PHYSICS**
TIME	**:**	**30 MINS.**

MAX. MARKS : 30

SECTION – A
TO BE ANSWERED IN THE QUESTION PAPER ITSELF
ANSWER ALL THE QUESTIONS: (30 × 1 = 30)

I. CHOOSE THE RIGHT OPTION:

1. The nature of binding for a crystal with alternate and evenly spaced positive and negative ion is
   a) Ionic   b) covalent   c) metallic   d) dipole

2. What is the nature of binding in CH_4
   a) Covalent   b) ionic   c) metallic   d) dispersion

3. Errors in change distribution are termed as
   a) Compositional defect   b) electronic defect   c) point defect   d) line imperfection

4. As temperature increases the fraction of vacant lattice site
   a) Increase   b) decrease   c) remain constant   d) linearly increases

5. The classical value of molar electronic specific heat is
   a) 1.5R   b) 0.5 R   c) 3 R   d) 4.5 R

6. The unit of hall coefficient is
   a) $Vm^3 A^{-1} wb^{-1}$ b) $V^2 A\, wb^{-1}$ c) $V\, m^3 A^1\, wb^{-1}$ d)$Vm^2 A^{-2} wb$

7. Which of the following relation gives Wiedman-Franz law
   a) $\sigma_{T/}\, \sigma = LT$ b) $\sigma/\, \sigma_T = LT$ c) $\sigma_{T/}\, \sigma = L/T$ d) $\sigma/\, \sigma_T = T/L$

8. Relative permeability of a medium is the permeability relative that of
   a) water   b) vacuum   c) iron   d) none of the above

9. The temperature below which certain marterials are antiferromagnetic and above which they are Paramagnetic
   a) Curie temperature   b) Neel temperature
   c) transition temperature   d) Weiss temperature

10. eB/2m is called
    a) Debye angular frequency   b) Larmor angular frequency
    c) Bohr magneton   d) non e of the above

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11. The width of the energy gap of super conduction is maximum at
a) 0^oK b) transition temperature   c) room temperature   d) none of the above

12. The transition temperature of most super conducting elements lie in the range
a) Zero to 10 K   b) 10K top 20K   c) 20K to 50K   d) above 50K

13. On cooling below critical temperature the entropy of the super conduction
a) Increases   b) decreases   c) remains same

14. If the mobility of electron in a metal increases. The resistivity
a) Decrease   b) increases   c) remains constant

15. Which of the following material does not have permanent magnetic deposits?
a) Paramagnetic   b) diamagnetic   c) ferri magnetic   d) anti – ferromagnetic

II. STATE WHETHER TRUE OR FLASE:

16. Induced dipole moment occurs in dia magnetic materials only.
17. Super conducting state is more ordered than the normal state for type I superconductor.
18. Most widely used conducting materials are germanium and silicon.
19. Covalent bonding is also known as homopolar or electron-pair bonding.
20. Close-packed structures have fewer Frenkel defects than schottky defect.

III. FILL IN THE BLANKS:

21. ……………..…….. bond is similar to the covalent bond.
22. Edge dislocation and screw dislocation are ……………..defects.
23. Type I superconductors are also known as ………………..…… Superconductors.
24. The total magnetic moment per unit volume is ……………..……
25. The sign of current carrying charges can be determined by……………..…….effect.

IV. ANSWER BRIEFLY:

26. What is a covalent bond?

27. What is Schottky defect ?

28. What is relaxation time ?

29. How does the critical magnetic field vary with temperature in type II superconductors?

30. What is the unit of permeability?

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TIME   : **2 HOURS 30 MINS.**   **MAX. MARKS : 70**

SECTION - B
ANSWER ANY FIVE QUESTIONS: **(5 × 5 = 25)**

1. Write a note on hydrogen bond and vanderwals bond

2. Distinguish Schottky defect and Frenkel defect.

3. a) Explain the main draw backs of classical free electron theory.

   b) State Wiedemann Franz law.

4. Give an explanation for hysteresis loop of a ferromagnetic material based on domain theory.

5. Calculate the drift velocity of the electrons and current density in a copper wire of diameter $0.16 cm$ which carries a steady current 0f $10 A$. Given the electron density $n = 8.46 \times 10^{28} / m^3$.

6. Lead in the superconducting state has critical temperature of 6.2K at zero magnetic field and a critical field 0.064 Am^{-1} at 0 K. Determine the critical field at 4 K.

7. The potential energy of a system of two atoms is given by the expression $U = - A/r^2 + B/r^{10}$ .A stable molecule is formed with release of 8eV of energy when the interatomic distance is 2.8 angstrom. Calculate A and B.

SECTION – C
ANSWER ANY THREE QUESTIONS: **(3 × 15 = 45)**

8. Explain the term binding energy . How is it calculated for an ionic crystal having sodium chloride structure.

9. Arrive at London's equations and discuss how its solution explains Meissner effect.

10. Explain Langevins theory of diamagnetism.

11. What is Hall coefficient ? Describe experimental set up for the measurement of Hall Voltage.

12. Estimate the lattice vacancies present in a crystal at thermal equilibrium.

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