TM142450A **Reg.No.....**
Name:.....

M. Sc. DEGREE (CSS) EXAMINATION, APRIL, 2015
SECOND SEMESTER – CORE (PHYSICS)
PHY2CMP-CONDENSED MATTER PHYSICS

Time : Three Hours **Maximum weight: 30**

PART A

I. Answer any *SIX* questions. Each question has a weightage 1

1. Describe Weidmann Franz Lorentz law
2. What is meant by geometrical structure factor
3. What are Brillouin Zones
4. Write a note on Hall effect in semiconductors
5. What is meant by acoustic mode of wave propagation in a linear diatomic crystal
6. Distinguish between anti ferroelectricity and piezoelectricity
7. What are the various contributions to total polarisability.
8. Explain quantization of flux in superconductors
9. Write a note on ferromagnetic domains.
10. Write a note on quantum confinement

(6x1=6)

PART B

II. Answer any *FOUR* questions. Each question has a weightage 2

11. Define reciprocal lattice. Show that reciprocal lattice to FCC is BCC
12. What do you mean by density of states in metals
13. At what temperature we can expect a 10% probability that electron in silver have an energy which is 1% above the Fermi energy. The Fermi energy of silver is 5.5 eV.
14. The visible light of wavelength $4000A^0$ undergoes scattering from a diamond crystal of refractive index 2.42. Calculate the frequency of phonon generated and fractional change in frequency of the incident radiation , given velocity of sound in diamond as 5000m/s

15. If all the molecular dipoles in a 0.1cm radius water droplet is pointed in the same direction. Calculate the intensity of polarisation. Dipole moment of water molecule is $6X10^{-30}$Cm.
16. A paramagnetic salt is placed in an external magnetic field of strength 10^6 ampere/m. Calculate the average magnetic moment per dipole at 600K.

(4x2=8)

PART C

III. Answer *ALL* questions. Each question has a weightage 4

17(a) Describe the theory and experiments set up for the powder method of X ray diffraction. Compare it with rotating crystal method

OR

(b) Based on Fermi Dirac Statistics, describe Fermi Dirac Distribution function. Discuss the effect of temperature on FD Distribution.

18(a) Deduce expressions for the densities of free electrons and holes in an intrinsic semiconductor. Show that Fermi level lies half way between conduction and valence band

OR

(b) Give Kroning Penny model for an electron in a periodic potential. What are its consequences

19(a) Discuss Debye model of lattice specific heats capacity. What is Debye T^3 law.

OR

(b) Deduce the vibrational modes of a one dimensional monatomic lattice. How does this model help in calculating the specific heat

20(a) How does the electrical , magnetic, thermodynamic and optical properties of superconductors differ from that of a normal conductor. Give some applications of superconductors.

OR

(b) Discuss the quantum theory of paramagnetism and discuss the low temperature and high temperature cases.

(4x4=16)