



QP CODE: 20000684



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Reg No : .....

Name : .....

**MSc DEGREE (CSS) EXAMINATION , NOVEMBER 2020**

**Second Semester**

M Sc PHYSICS

**CORE - PH010204 - CONDENSED MATTER PHYSICS**

2019 Admission Onwards

BB240736

Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)**

*Answer any **eight** questions.*

*Weight 1 each.*

1. Define the structure factor.
2. Which are different symmetry operations.
3. Define fermi energy.
4. Do free electron model support energy band gap in materials? Substantiate your answer.
5. What do you understand when you see the term “ extended scheme representation of energy levels”?
6. Good conductors show positive temperature coefficient where as semi conductors show negative temperature coefficient. Explain this phenomenon.
7. Write a short note on thermal resistance of solids.
8. What is meant by quenching of the orbital angular momentum?
9. What is meant by ferromagnetism?
10. Briefly explain neutron magnetic scattering.

(8×1=8 weightage)

**Part B (Short Essay/Problems)**

*Answer any **six** questions.*

*Weight 2 each.*

11. Derive the reciprocal lattice to FCC lattice.
12. Obtain the eigen values and normalized functions for a particle in a one dimensional infinite potential box of side a





13. A uniform copper wire whose diameter is 0.16cm carries a steady current of 10A. its density and atomic weight is respectively 8920kg/m<sup>3</sup> and 63.5. Calculate the current density and drift velocity of electrons in copper.
14. The intrinsic carrier concentration of germanium sample is  $2.4 \times 10^{19}/\text{m}^3$  at 300K and its electron and hole mobilities are 0.39 and 0.19 m<sup>2</sup>v<sup>-1</sup>s<sup>-1</sup> respectively. Calculate the conductivity of the sample
15. If the velocity of sound in a solid is taken to be  $3 \times 10^8$  m/s and the interatomic distance  $6 \times 10^{-10}$ m, calculate the value of cutoff frequency assuming a linear lattice.
16. Describe the quantisation of elastic waves in a diatomic lattice.
17. Deduce the expression for the susceptibility of an antiferromagnetism below the Neel temperature.
18. Give an account of geomagnetism and biomagnetism.

(6×2=12 weightage)

### Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Write Bragg's equation and explain the X-ray diffraction method.
20. Explain Kroning-Penny model. How it leads to the concept of Band gap energy.
21. Discuss Debye model of lattice heat capacity. Derive an expression for it.
22. Explain the different contribution for the formation of domains in a ferromagnetic material and show how the hysteresis curve explained on the basis of domain theory.

(2×5=10 weightage)

