GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (Fourth Semester) Examinations, May – 2024

20PHPE402 - Condensed Matter & Materials Physics - 2

(Physics)

Time: 3 hrs   Maximum: 70 Marks

(The figures in the right-hand margin indicate marks.)

PART – A   **(2 x 10 =20 Marks)**

Q.1. Answer ALL Questions

a.	What is meant by hysteresis in ferromagnetic magnetic materials?	CO1	K1
b.	What is anti-ferromagnetism? Draw the variation of susceptibility with temperature for antiferromagnetic materials.	CO1	K1
c.	The magnetic susceptibility of silicon is $-4.0*10^{-5}$. What is the flux density and total magnetic moment per unit volume in a magnetic field of intensity 10^5amp/m?	CO1	K2
d.	Explain the terms spin waves and magnons	CO1	K1
e.	What is dielectric polarization? Discuss different polarization mechanisms.	CO2	K1
f.	What is a complex dielectric constant?	CO2	K1
g.	State Bragg's law? Why Xray is used for crystal diffraction.	CO3	K1
h.	What is crystallization temperature	CO3	K1
i.	Differentiate between SEM and TEM.	CO3	K1
j.	What are the four 4 types of nanomaterials? Mention some applications of the nano- materials.	CO4	K1

PART – B   **(10 x 5 = 50 Marks)**

Answer *ANY FIVE* the questions

		Marks	CO#	Blooms Level
2. a.	Describe briefly the domain theory of ferromagnetism. Derive Curie -Weiss law for their susceptibility.	10	CO1	K2
3.a.	Derive Curie's law for paramagnetic susceptibility quantum mechanically. How this theory removes Langevin's theory?	8	CO1	K2
b.	Discuss ferroelectric domains.	2	CO1	K1
4.	Discuss dipolar, ionic, and electronic polarizabilities. Plot a graph in total polarizability and frequency, clearly indicating the contributions of all the three polarizabilities.	10	CO2	K2
5.	Discuss Lorenz field in solid dielectric and hence derive the Clausius-Mossotti relation.	10	CO2	K2
6. a.	Block diagram of heat flux DSC.	3	CO3	K1
b.	If glass transition, melting temperature and crystallization temperature are put all together, how the graph is look like?	7	CO3	K2
7.a.	Discuss the structure of various forms of Carbon-based nano- materials and their applications.	7	CO4	K1

b.	List out the properties of materials that are being affected by nano- meter size of particles with suitable examples.	3	CO4	K2
8. a.	Discuss the density of states for 3D bulk material.	8	CO4	K2
b.	Draw the density of states vs energy and no of states vs energy graph in a quantum wire	2	CO4	K2

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