# B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2020

## SEMESTER – 6: PHYSICS (CORE COURSE)

### COURSE: 15U6CRPHY11: CONDENSED MATTER PHYSICS

*(Common for Regular 2017 Admission & Supplementary 2016 /2015/2014 Admissions)*

Time: Three Hours                                                                              Max. Marks: 60

### PART A

#### Answer *all* questions; each question carries *1* mark

1. Is diamond a loosely packed structure? Why?

2. What is Bravais lattice?

3. What is meant by van der Waal type of bonding?

4. Write a short note on Madelung constant.

5. What are extrinsic semiconductors?

6. Distinguish between ferrimagnets and antiferromagnets.

7. Write a short note on spintronics

8. What is ac Josephson effect?

9. What is the effect of temperature on polymers?

10. Mention any two properties of liquid crystals                                    (1 x 10 = 10)

### PART B

#### Answer *any seven* questions; each question carries *2* marks

11. What is a reciprocal lattice?

12. State Bloch theorem.  Express the Bloch function mathematically.

13. Write down the Clausius – Mosotti relation and state its physical significance.

14. Discuss the origin of ferroelectricity.

15. Explain why diamagnetic materials have negative susceptibility.

16. State the Curie's law and define Curie's temperature.

17. Write down the London equations in superconductivity.  What is their significance?

18. Discuss the band tailing effect in amorphous semiconductors

19. State the properties of thin films.                                                   (2 x 7 = 14)

### PART C

#### Answer *any four* questions; each question carries *4* marks

20. A crystal plane makes intercepts: $a$, $\frac{1}{2}b$, $\frac{3}{2}c$ with the crystallographic axes.  Find the miller indices of the plane.

21. What is packing fraction? Determine the packing fraction of hcp structure.

22. An electric field of 100V/m is applied to a sample of n type semiconductor whose Hall coefficient is -0.0125 m$^3$/C. Determine the current density if the electron mobility is 0.36m$^2$/V-s.

23. Derive the Clausius- Mossotti relation connecting dielectric constant and polarisability.

24. A magnetizing field of 1600A/m produces a magnetic flux of 2.4x10$^{-5}$ Weber in a bar of iron of cross section 0.2cm$^2$. Calculate the permeability and susceptibility of the bar.

25. The critical fields at 6K and 8K for a material are 7.616 A/m and 4.284 A/m respectively. Determine the transition temperature and critical field at 0K.                                    (4 x 4 = 16)

**PART D**

Answer ***any two*** question; each question carries ***10*** marks

26. Explain Hall effect. Derive the expression for Hall co-efficient.

27. What is ferro magnetism? Obtain Curie-Weiss law of ferromagnetism. Briefly explain Hysteris curve in ferromagnets.

28. What is superconductivity? Discuss any three characteristic properties of superconductors. Also give a brief account on high Tc superconductors.

29. Explain the different types of nanomaterials. Also discuss the applications of nanotechnology.

                                                                                            (10 x 2 = 20)

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