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24019

B. Tech. 2nd Semester (Common for all Branches) (Re-Appear) Examination – October, 2020

PHYSICS-II

Paper : Phy-102-F

Time : 1.45 hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *three* questions. All questions carry equal marks.

1. Describe the following :

(a) Define space lattice, translation vector and coordination number.

(b) State Ehrenfest theorem. Also give its mathematical form.

(c) Discuss applications of quantum dots.

(d) What are the limitations of free electron theory ?

(e) What are Brillouin zones ? Explain.

(f) Work function of a metal is 2eV, find out the maximum wavelength of photon required to emit electron from its surface ?

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(g) Why does a paramagnetic sample display a greater magnetism when cooled ?

(h) Explain the term spontaneous magnetization.

(i) Define the Quarks and Gluons.

(j) Draw the following planes (110), $(\bar{1}\,\bar{1}\,\bar{1})$, $(\bar{1}\,\bar{1}\,0)$.

2. (a) What are point defects in solids ? What are different types of point defects ? Explain.

(b) Explain with necessary theory of the powder method for X-ray analysis.

(c) What are Miller Indices ? Give their significance.

3. (a) Derive time independent Schrodinger's Wave equation. What role this equation plays in quantum physics ? Explain.

(b) How was Planck's constant discovered ? Discuss the development details. https://www.mdustudy.com

(c) Prove that group velocity is less than the phase velocity in dispersion medium.

4. (a) What is free electron theory of metals ? Derive an expression for conducting of metals based on Drude - Lorentz theory.

(b) What is Fermi Dirac distribution function ? Discuss salient features and results derived from the concept.

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5. Discuss the phenomenon of thermionic emission in metals. Derive Richardson - Dushan equation for emission current density.

6. (a) What is Hall effect ? Derive an expression for Hall Coefficient. Discuss some important applications of this effect.

   (b) What are E-K diagram ? What do you mean by –ve mass ? Explain.

7. (a) What is photoconductivity ? Discuss a simple model of photoconductor. Show that sensitive photoconductors should have long response time.

   (b) What are traps ? Discuss a simple model to show the effect of traps on the photoconductivity.

8. Distinguish between diamagnetism, paramagnetism and ferromagnetism. Derive an expression for diamagnetic susceptibility based on Langevin theory and show it is independent of temperature.

9. (a) Explain the origin of atomic dipole moments.

   (b) What is the physical basis of diamagnetism and paramagnetism of materials ? Describe the Weiss Molecular theory of ferromagnetism and derive the Curie Weiss Law.

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