

Code No.: R22AP102BS

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**CMR ENGINEERING COLLEGE : HYDERABAD**  
**UGC AUTONOMOUS**  
**I-B.TECH-I-Semester End Examinations (Regular) - February- 2024**  
**APPLIED PHYSICS**  
**(Common for IT, CSD, CSM)**

[Time: 3 Hours]

[Max. Marks: 60]

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 10 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A**

**(10 Marks)**

1. a) Define Wien's displacement law. Give its limitations [1M]
- b) Define effective mass of an electron. [1M]
- c) Why do we prefer Silicon for transistors? [1M]
- d) What is the meaning of photovoltaic effect? [1M]
- e) What are dielectric materials? Give its properties [1M]
- f) What is the relation between relative permeability and magnetic susceptibility? [1M]
- g) What is called bottom-up approach? [1M]
- h) What is XRD technique for nanoparticles? [1M]
- i) What is the use of nitrogen and helium in CO<sub>2</sub> laser? [1M]
- j) What is total internal reflection? [1M]

**PART-B**

**(50 Marks)**

2. What are matter waves? Describe Davisson and Germer's experiment to support the existence of matter waves. [10M]

**OR**

3. Explain the behavior of an electron moving in a field of periodic potential using Kronig and Penny model. [10M]

4. What is Hall effect? Derive an expression of Hall-coefficient for P- type and N-type semiconductors. [10M]

**OR**

5. What is meant by photodiode? Discuss the structure, working principle and characteristics of avalanche photodiode (APD). [10M]

6. a) Explain various polarization mechanisms in dielectrics. [6M]
- b) Give an account on Ferro-electricity and its applications. [4M]

**OR**

7. a) Explain the theory of multiferroics and discuss the advances in multiferroics. [6M]
- b) Describe the applications of solid fuel cells [4M]

8. Explain in detail, how nanomaterials are synthesized by chemical vapor deposition (CVD)? Mention the applications of CVD method. [10M]

**OR**

9. Describe the principle, construction and working of scanning electron microscope (SEM) and give its advantages and disadvantages. [10M]

10. Describe the principle, construction and working of He-Ne laser and also mention the applications of it. [10M]

**OR**

11. a) Derive an expression for acceptance angle of an optical fiber [6M]
- b) Calculate Numerical aperture and critical angle, when core and cladding refractive indices are 1.48 and 1.42 respectively. [4M]

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