

I B. Tech II Semester Supplementary Examinations, Jan/Feb-2024
APPLIED PHYSICS

(Common to EEE, ECE, EIE, ECT, CSE-AI&ML, CSE-AI, CSE-DS, CSE-AI&DS, AI&DS)

Time: 3 hours

Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

UNIT-I

1. a) With the help of neat diagram explain the construction and working of Nicol's prism. [7M]
- b) Derive the expression for thickness half wave plate. [4M]
- c) Calculate the thickness of a Mica sheet required for making a quarter-wave plate for $\lambda = 5460 \text{ \AA}$. The indices of refraction for the ordinary and extraordinary rays in mica are 1.586 and 1.592 respectively. [3M]

(OR)

2. a) Explain the Fraunhofer's diffraction due to single slit and derive the condition for primary maxima, secondary maxima and minima. [10M]
- b) A diffraction grating having 4000 lines per inch is used at normal incidence. Calculate dispersive power of the grating in second-order spectrum in the 500 nm wavelength region. [4M]

UNIT-II

3. a) What are the characteristics of a laser beam? Distinguish between stimulated and spontaneous emission processes. [8M]
- b) What do you mean by laser pumping? Explain four-level pumping schemes for laser action. [6M]

(OR)

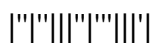
4. a) Explain the principle of optical fiber. [4M]
- b) Explain in detail how optical fibers are classified according to the material, refractive index and modes of propagation. [10M]

UNIT-III

5. a) State de-Broglie's hypothesis. Derive an expression for de-Broglie wavelength and using it show that an electron accelerated by a potential difference V volts is $\lambda = \frac{1.226}{\sqrt{V}} \text{ \AA}$ [10M]
- b) Explain the physical significance of wave function (ψ). [4M]

(OR)

6. a) Derive an expression for the current density of a metal by using quantum free electron theory. [8M]
- b) Write notes on classification of solids basing on band theory. [6M]



UNIT-IV

7. a) What is ionic polarization? Obtain an expression for ionic polarizability. [7M]
b) Derive an expression for local field in a dielectric material. [7M]

(OR)

8. a) Write notes on the origin of permanent magnetic materials and derive the expression for orbital magnetic movement of an electron. [7M]
b) Explain the hysteresis of ferromagnetic material with the help of the B-H curve. [7M]

UNIT-V

9. a) Describe Fermi level in intrinsic semiconductor and hence obtain the expression for Fermi energy in terms of the energy gap of intrinsic semiconductor [7M]
b) What is the difference between drift and diffusion currents in a semiconductor? Establish Einstein's equation for mobilities and diffusion coefficients of charge carriers. [7M]

(OR)

10. a) Discuss Josephson AC and DC effects. [7M]
b) Write short notes on SQUIDS. Discuss the engineering applications of semi conductors. [7M]

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