Code No: **R201207** **R20** **SET - 1**

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

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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 λ = 5460 Å 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 $\lambda = \frac{1.226}{\sqrt{V}}$ Å	[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]
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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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