Code No.: R22AP102BS	R22	H.T.No.			8	R						

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
I–B.TECH–I–Semester End Examinations (Supply) – June - 2025
APPLIED PHYSICS
(Common for IT, CSC, CSD, CSM, ECE)

[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)	State Heisenberg's uncertainty principle.	[1M]
b)	What is the significance of the E-K diagram in solids?	[1M]
c)	What is the Hall effect?	[1M]
d)	Mention one application of a Zener diode.	[1M]
e)	What are piezoelectric materials?	[1M]
f)	Name one material used in rechargeable ion batteries.	[1M]
g)	What is quantum confinement?	[1M]
h)	Identify one characterization technique used in nanotechnology and explain its purpose.	[1M]
i)	What is the principle of total internal reflection?	[1M]
j)	Name one application of lasers in the medical field.	[1M]

PART-B **(50 Marks)**

2.a)	Explain photoelectric effect and its significance in quantum physics.	[5M]
b)	Derive the time-independent Schrödinger wave equation for a particle in a one-dimensional potential box.	[5M]
	OR	
3.a)	Discuss the de Broglie hypothesis and describe the Davisson and Germer experiment to validate it.	[5M]
b)	Compare the Drude-Lorentz model with the free electron theory in solids.	[5M]
4.	Explain the working principle and V-I characteristics of P-N junction diode with a neat diagram.	[10M]
	OR	
5.a)	Differentiate between direct and indirect band gap semiconductors with examples.	[5M]
b)	Analyze the role of Zener diodes in voltage regulation circuits.	[5M]
6.a)	Describe the different types of polarization in dielectric materials.	[5M]
b)	Explain the working principle of piezoelectric materials and their applications.	[5M]
	OR	
7.a)	Compare the characteristics of soft and hard magnetic materials.	[5M]
b)	Explain superionic conductors.	[5M]
8.a)	Explain the bottom-up and top-down approaches in nanofabrication with examples.	[5M]
b)	Describe the sol-gel method of nanoparticle synthesis.	[5M]
	OR	
9.a)	Assess the advantages of nanomaterials in electronics and medicine.	[5M]
b)	Compare the characterization techniques: XRD, SEM, and TEM.	[5M]

10.a)	Explain the construction and working of a He-Ne laser.	[5M]
b)	Discuss the three quantum processes involved in lasing action.	[5M]

OR

11.a)	Derive the expression for numerical aperture in an optical fiber.	[5M]
b)	Evaluate the significance of optical fibers in communication systems.	[5M]

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