Code No.: R22AP202BS	R22	H.T.No.			8	R						

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
I–B.TECH–II–Semester End Examinations (Supply) – December - 2025
APPLIED PHYSICS
(Common for ECE, CSE, IT)

[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)	What physical quantity does Planck's constant represent?	[1M]
	b)	What is electron effective mass?	[1M]
	c)	Name the specific mechanism responsible for reverse breakdown in a Zener diode.	[1M]
	d)	Why does LED emission color depend on bandgap?	[1M]
	e)	What is the primary function of a separator in a rechargeable battery?	[1M]
	f)	Why are liquid electrolytes used in batteries?	[1M]
	g)	What is the resolution limit of SEM?	[1M]
	h)	How does quantum confinement change band gap?	[1M]
	i)	Name the active medium and the pump source used in a Ruby laser.	[1M]
	j)	What is the primary cause of material dispersion in optical fibers?	[1M]

PART-B **(50 Marks)**

2.		Discuss blackbody radiation, How did Planck's radiation law resolve the issues with classical theories?	[10M]
		OR	
3.		Using the Kronig-Penney model, explain the formation of allowed energy bands and forbidden band gaps in solids. How does the model account for the difference between conductors, semiconductors, and insulators?	[10M]
4.		Describe the principle of operation and characteristics of a Zener diode.	[10M]
		OR	
5.		Explain the construction, working, and characteristics of a BJT and mention few applications.	[10M]
6.		Distinguish soft and hard magnetic materials with examples and explain hysteresis loop.	[10M]
		OR	
7.		Explain the working principles and key performance metrics of rechargeable ion batteries.	[10M]
8.		Explain the principle and working of X-ray Diffraction (XRD) for nanomaterial characterization.	[10M]
		OR	
9.		Explain surface-to-volume ratio in nanomaterials. Describe ball milling (top-down) synthesis method.	[10M]

10. Describe the construction and working principle of a He-Ne laser and mention few applications. [10M]

OR

11. Derive expressions for acceptance angle and numerical aperture in optical fibers. [10M]

****