

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Second Semester

Mechanical Engineering

PH3251 / UPHT24205 - Materials Science

Regulations – 2021 & 2024

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2 = 20)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Differentiate crystalline and amorphous materials.	L2	1	2
2.	Define polymorphism with an example.	L1	1	2
3.	Represent the concept of quantum tunneling.	L2	2	2
4.	Classify three types of materials based on energy bands in solids.	L2	2	2
5.	Calculate the energy band gap of semiconductor when its output wavelength is 530 nm.	L3	3	2
6.	Draw the symbol of Schottky diode.	L2	3	2
7.	Classify three types of optical materials based on their interaction with visible light.	L2	4	2
8.	Represent the term plasmonics.	L2	4	2
9.	What is Coulomb blockade effect used in single electron transistor?	L1	5	2
10.	Differentiate active and passive optoelectronic devices with examples.	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Examine the number of atoms per unit cell, atomic radius, coordination number and atomic packing factor for the Body centered cubic (BCC) crystal structure.	L3	1	16
	Or			
	b Describe the nucleation process in crystallography and explain how the phase changes occur in homogeneous and heterogeneous nucleation.	L3	1	16
12.	a i Mention the postulates of classical free electron theory of metals.	L2	2	4
	ii Derive an expression for electrical conductivity and thermal conductivity of metals.	L4	2	12
	Or			
	b i Infer the principle of superconducting quantum interference device (SQUID).	L2	2	4
	ii Examine the properties of Dia, para and ferromagnetic materials with examples.	L4	2	12

13.	a	Explain intrinsic semiconductor and derive an expression for the carrier concentration in intrinsic semiconductors.	L2	3	16
	Or				
	b	Describe the theory of Hall effect and show that the Hall coefficient is negative for N-type semiconductor.	L2	3	16
14.	a i	Examine the optical absorption, emission and charge injection processes in semiconductors with neat sketch.	L2	4	12
	ii	Differentiate the generation and recombination of charge carriers in semiconductors.	L2	4	4
	Or				
	b i	Explain the principle, construction, working and applications of light emitting diode.	L2	4	12
	ii	Infer the principle used in modulators and switching devices.	L2	4	4
15.	a	Interpret the energy versus density of state curves for the quantum dots, quantum wires and quantum wells with examples.	L3	5	16
	Or				
	b	Exemplify the properties of carbon nanotubes and its applications in various fields.	L3	5	16