ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E Full Time END SEMESTER EXAMINATIONS, DEC 2024
ECE
II Semester
PH5202 - SEMICONDUCTOR PHYSICS AND DEVICES
(Regulation 2019)

Time: 3hrs   Max.Marks: 100

CO 1	Ability to recall the basics of electronics states and understand the energy band structure formation
CO 2	Ability to understand the importance of carrier concentration and doping in semiconductors
CO 3	Ability to demonstrate the Physics of transport & charge carriers
CO 4	Ability to understand the importance of optical properties of materials
CO 5	Ability to apply the physics of derives and importance of quantum structures

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	What is the need of reciprocal lattice to study crystals?	2	1	L4
2	Give the importance of effective mass.	2	1	L4
3	Draw Fermi –dirac distribution at T=0K and T>0K	2	2	L3
4	Where is the location of fermi level in p type semiconductor?	2	2	L2
5	Define mobility.	2	3	L1
6	Differentiate drift and diffusion	2	3	L5
7	What is Quasi fermi level?	2	4	L1
8	What is phonon?	2	4	L1
9	What are the conditions to create hetero junction semiconductors?	2	5	L4
10	Name any two passive opto electronic device.	2	5	L2

PART- B (5 x 13 = 65 Marks)

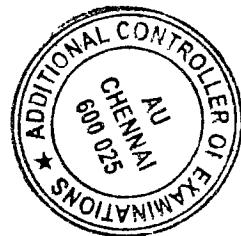| Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain in detail the nearly free electron model and obtain the expression for conductivity.	8	1	L2
(ii)	State merits and demerits of nearly free electron model	5	1	L4
OR				
11 (b) (i)	Explain the Kronig-Penny model	8	1	L2
(ii)	Explain the basics of the band theory of solids to differentiate metals, semiconductors, and insulators.	5	1	L4
12 (a)	Obtain an expression for electron density in conduction band of intrinsic semiconductors	13	2	L1
OR				
12 (b) (i)	Obtain an expression for electron density in n type semiconductor	8	2	L1
(ii)	Sketch the temperature dependence of charge carriers in extrinsic n-type semiconductors	5	2	L2
13 (a) (i)	Explain in detail with neat diagrams about avalanche breakdown .	6	3	L1
(ii)	Explain in detail with neat diagrams about Zener tunneling	7	3	L1
OR				

13 (b)	Write an essay about carrier transport by drift and diffusion. Obtain Einstein's relation.	13	3	L1
14 (a) (i)	Detail the carrier generation and recombination processes with necessary diagrams	10	4	L2
(ii)	Analyze the generation rate and the recombination rate at steady state.	3	4	L5
OR				
14 (b) (i)	Explain the construction, working and advantages of Semiconductor laser with necessary energy level diagrams	10	4	L2
(ii)	A photon released from a semiconductor laser has frequency of 6×10^{14} Hz. Calculate the energy gap of the semiconductor.	3	4	L5
15 (a)	Write an essay about processing of semiconductor devices	13	5	L1
OR				
15 (b)	Explain the construction and working of N channel MOSFET	13	5	L1

PART- C (1 x 15 = 15 Marks)

Q. No	Questions	Marks	CO	BL
16. (i)	Derive the expression of density of states with neat diagram	12	2	L3
(ii)	Sketch the density of states with respect to energy in metals	3	2	L5