Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
B.Tech (Full Time) - END SEMESTER EXAMINATIONS, 2024 – April / May

Information Technology

II Semester

PH3202 PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

(Regulation 2023)

Time: 180 minutes | Answer ALL Questions | Max.Marks : 100

CO 1	To understand and apply the electrical properties of materials
CO 2	To explore the principles of semiconductor and display devices
CO 3	To make use of magnetic and optical data storage devices
CO 4	To implement the essential principles of digital electronics for communication
CO 5	Understand the basics of quantum structures and their applications and basics of quantum computing

BL – Bloom's Taxonomy Levels

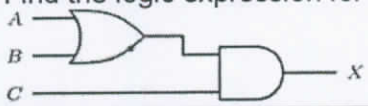
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

Q. No	Questions	Marks	CO	BL
1	What is the average time taken by an electron to drift 1 μm in pure silicon at an electric field of 100 V/cm? Given μ_n = 1350 cm^2 / Vs at room temperature.	2	1	L3
2	What is meant by compensation doping?	2	1	L2
3	Mention the types of luminescence.	2	2	L1
4	Determine the wavelength of LED fabricated by GaAs material with the bandgap of 1.43eV.	2	2	L3
5	What is the origin for magnetic moment in magnetic material?	2	3	L1
6	Compare photography and holography.	2	3	L2
7	Convert $(10010110)_2$ to decimal value.	2	4	L3
8	State De Morgan's theorem.	2	4	L1
9	How are quantum confined structures classified?	2	5	L1
10	Give any four advantages of quantum computing over classical computing.	2	5	L2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Derive an expression of electron concentration in intrinsic semiconductor.	10	1	L2
(ii)	Metallic silver is an excellent conductor. It has 5.86 x 10^{28} conduction electrons per cubic meter. Calculate its Fermi energy.	3	1	L3
	OR			
11 (b) (i)	Derive an expression for carrier concentration in p-type semiconductor.	10	1	L2
(ii)	Consider a sample of p type semiconductor, with the acceptor density $10^{20}/m^3$. If the intrinsic carrier concentration is 2.5 x 10^{19} $/m^3$, determine the electron and hole densities at 300K.	3	1	L3
12 (a) (i)	Based on the theory of Hall effect explain in detail how to measure Hall voltage for an n-type semiconductor.	10	2	L2
(ii)	How does Peltier coolers work?	3	2	L2

	OR			
12 (b) (i)	Describe the construction and working of LCD.	**10**	2	L2
(ii)	Briefly explain the principle of OLED.	**3**	2	L2
13 (a) (i)	What is Giant Magnetoresistance and how is it used in magnetic hard disc as GMR sensor to read the data.	**10**	3	L3
(ii)	Differentiate soft and hard magnetic materials. Give any six points.	**3**	3	L2
	OR			
13 (b) (i)	Explain in detail the magneto-optical data storage system with neat figures.	**10**	3	L3
(ii)	Compare CD, DVD and Blur-ay Disc.	**3**	3	L2
14 (a) (i)	Simplify the following Boolean expression $\overline{XY} + \overline{X} + XY$	**10**	4	L5
(ii)	Construct XOR gate using NAND gates	**3**	4	L5
	OR			
14 (b) (i)	Solve the following using K-map F(A, B, C, D) = ∑(1,3,7,11,15) + ∑ d(0,2,5). Here d denotes the don't care condition	**10**	4	L5
(ii)	Find the logic expression for the circuit below. 	**3**	4	L5
15 (a)	Describe the construction and working of single electron transistor.	**13**	5	L3
	OR			
15 (b)	What are classical bits and qubits? Explain how a two qubits CNOT gate works?	**13**	5	L3

PART- C (1 x 15 = 15 Marks)

Q. No	Questions	Marks	CO	BL
16 (i)	What is density of states? Derive an expression for the number of allowed states for unit volume of a solid.	**11**	5	L3
(ii)	Show that the probability of a state ΔE above E_F is filled equals probability that a state ΔE below E_F is empty.	**4**	5	L6