LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

SECOND SEMESTER – **APRIL 2023**

PPH2ME01 – PHYSICS OF SEMICONDUCTOR DEVICES

Date: 10-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A – K1 (CO1)		
	Answer ALL the questions		**(5 x 1 = 5)**
1.	**Fill in the blanks**		
a)	____ is the equation corresponding to depletion approximation.		
b)	____ is the equation to calculate the concentration of charge carriers in a semiconductor related to the position of the Fermi level.		
c)	Depletion approximation merely states ____.		
d)	Emitter current crowding states ____.		
e)	The base transport factor is ____.		
	SECTION A – K2 (CO1)		
	Answer ALL the questions		**(5 x 1 = 5)**
2.	**Match the following**		
a)	In the p-type material the Fermi level	-	Depletion region
b)	Transition region	-	Closer to the top of the valence band
c)	The recombination rate	-	Capacitance of the depletion layer
d)	At reverse bias the capacitance of a p-n diode	-	Emitter current crowding
e)	The base spreading resistance	-	Proportional to the PN product
	SECTION B – K3 (CO2)		
	Answer any THREE of the following		**(3 x 10 = 30)**
3.	Develop the theory of depletion capacitance of a pn junction.		
4.	Model the Base Spreading Resistance and Emitter Current Crowding Base Contacts of BJT.		
5.	Build the Graded Base Transistors and explain.		
6.	Apply the principles of physics to explain the capacitances of different regions of MOSFET.		
7.	Develop the various fundamentals of photonic devices.		
	SECTION C – K4 (CO3)		
	Answer any TWO of the following		**(2 x 12.5 = 25)**
8.	Analyze the different break down mechanisms in a PN junction.		
9.	Discuss the function of PN junction under zero bias conditions.		
10.	Examine the characterization of amorphous silicon solar cell.		
11.	Inspect the diffusion capacitance and equivalent circuit of a p-n junction.		
	SECTION D – K5 (CO4)		
	Answer any ONE of the following		**(1 x 15 = 15)**
12.	Explain the different schemes of Bipolar Junction Transistors to fabricate in Integrated circuits with a neat diagram.		
13.	Interpret the sub-threshold currents in MOSFET.		
	SECTION E – K6 (CO5)		
	Answer any ONE of the following		**(1 x 20 = 20)**
14.	Discuss the surface charge in metal oxide semiconductor capacitor.		
15.	Elaborate the operation of photodetectors with suitable schematic diagram.		

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