SRM Institute of Science and Technology
College of Engineering and Technology

DEPARTMENT OF ECE

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2021-2022 (EVEN)

Assignment 2

Course Articulation Matrix with PI:

	18ECE322T- Optoelectronics		Program Outcomes (POs)																							PSO		
COs	Course Outcomes	BL	1	PI	2	PI	3	PI	4	PI	5	PI	6	PI	7	PI	8	PI	9	PI	10	PI	11	PI	12	PI	1	2	3
CO-1:	Define the basic concepts of optics and semiconductor optics.	1	3	1.4.1	-		-		-																			1
CO-2:	Demonstrate the working principle of various photonic sources and display devices.	3	3	1.2.1	3	2.1.2	-		2	4.1.1																		3
CO-3:	Analyze the principle and operation of various detectors and noise associated with it.	4	-		3	2.1.3	2	3.1.1	3	4.1.2																		3
CO-4:	Interpret the various optoelectronic modulators, switches, and interconnects.	3	3	1.3.1	2	2.2.1	3	3.2.1	-																			2
CO-5:	Apply the concepts of integrated optoelectronic components and its application in various fields.	3	3	1.4.1	-		3	3.2.2	3	4.2.1																		3

Assignment Questions (Answer All Questions)	BL	CO	PO	PI	M
The responsivity of a given p-i-n diode is 0.5A/W for a wavelength of 850nm. What is the output photocurrent when optical power of 0.2 µW is incident on it?	4	3	2	2.1.3	2
Differentiate phosphorescence and fluorescence. Calculate penetration depth of an electron beam (with energy = 10 keV) on a ZnS screen that produce cathodoluminescence. (Note: For ZnS, K = 1.2 × 10-4 , b = 1.75).	4	2	2	2.1.1	2
An injection laser has active cavity losses of 25 cm-1 and the reflectivity of each laser facet is 30%. Determine the laser gain coefficient for the cavity having a length of 500µm.	4	2	2	2.1.1	2
Consider a particular green LED based on InGaN MQW active region. The emission wavelength is 528 nm. At an LED current of 350 mA, the forward voltage is 3.4 V. The emitted luminous flux is 92 lm. Find the power conversion efficiency, external quantum efficiency, luminous efficacy, and the emitted optical power (radiant flux)	4	2	2	2.1.2	2
A Si APD has a QE of 70 % at 830 nm in the absence of multiplication, (M =1). The APD is biased to operate with a multiplication of 100. If the incident optical power is 10 nW, what is the photocurrent?	4	3	2	2.1.2	2
Consider an InGaAs pin photodiode used in a receiver circuit with a load resistor of 27 kΩ. The total capacitance of the detector and the input of the amplifier together is 16 pF. The photodiode has a dark current of 2 nA. The incident radiation is 5 nW at 1550 nm where the responsivity is 0.8 A/W. Assuming that the amplifier is noiseless, calculate the SNR at 300K.	4	3	2	2.1.3	2
An LED driving at 40mA current emit 1310 nm and having 30ns and 100ns radiative and non-radiative recombination times. Find the total recombination time, internal quantum efficiency and internal power level	4	2	2	2.1.2	2
For an InGaAsP laser operating at a wavelength of 1.3 µm, calculate the mode spacing in nanometer for a cavity of 300 µm, assuming that the group refractive index is 3.4.	3	2	3	3.1.1	2
Si PiN photodiode exposed to wavelength 700 nm (red light) and intensity 0.1 mW cm-2 light having an active light receiving area of diameter 0.4 mm generates a photocurrent of 56.6 nA. Calculate the responsivity and external QE of the photodiode at 700 nm.	3	3	2	2.1.3	2
A silicon PiN photodiode incorporated into an optical receiver has a quantum efficiency of 60% when operating at a wavelength of 0.9 µm. The dark current in the device is 3 nA and the load resistance is 4 kΩ. The incident optical power is 200 nW and the post detection bandwidth of the receiver is 5 MHz. Calculate the primary photocurrent, mean square quantum noise current, mean square dark current and mean square thermal noise current.	3	3	2	2.1.3	2