

Test: CLAT- 3

Date: 21-6-2022

Course Code & Title: 18ECE322T – OPTOELECTRONICS

Duration: 10.00 –11.40 AM

Year & Sem: 2nd Year / 4th Sem

Max. Marks: 50

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

Part – A
(10 x 1 = 10 Marks)
Instructions: Answer ALL the Questions

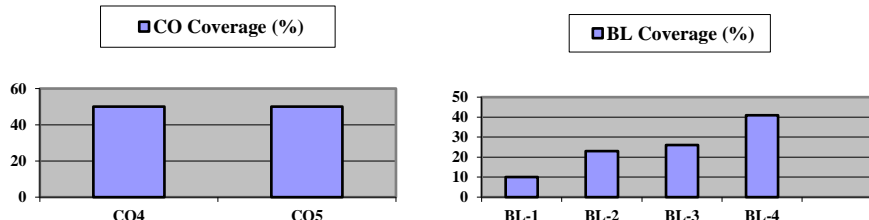
Q. No	Question	Marks	BL	CO	PO	PI
1	Representation of Pockels effect in analytical form (a) $\Delta n = a_4 E^4$ (b) $\Delta n = a_3 E^3$ (c) $\Delta n = a_1 E$ (d) $\Delta n = a_2 E^2$	1	2	4	1	1.3.1
2	Which of the following devices, allows light to pass in one direction and not in the opposite direction? (a) optical splitter (b) optical isolator (c) optical attenuator (d) optical modulator	1	1	4	1	1.3.1
3	In a broadcast and select configuration a 3x3 switch is made up of .....1x1 switches (a) 3 (b) 9 (c) 5 (d) 2	1	2	4	1	1.3.1
4	What is the relationship between strain and refractive index in an acousto optic modulator? (a) $\Delta(1/n) = pS$ (b) $\Delta(n^2) = pS$ (c) $\Delta(n) = pS$ (d) $\Delta(1/n^2) = pS$	1	2	4	3	3.2.1
5	For a optical modulator, if there is no presence of mismatch between the phases, the mismatch is represented as, (a) $\Delta\beta = \infty$ (b) $\Delta\beta = 1$ (c) $\Delta\beta = -1$ (d) $\Delta\beta = 0$	1	1	4	1	1.3.1
6	..... is used to produce TE/TM conversion for a signal beam optical velocimeter. (a) Quarter wave plate (b) Half wave plate (c) Polarizer (d) Spectrum analyzer	1	1	5	1	1.4.1
7	What is the operating frequency, bit rate and laser source of an Integrated Analog to Digital Convertor? (a) 1.15 μ m, He-Ne and 100 GHz (b) 1.5 μ m, Dye and 100 MHz (c) 1.15 μ m, He-Ne and 100 MHz (d) 1.15 μ m, Dye and 100 GHz	1	2	5	1	1.4.1
8	..... is the switching device based on Electro optic effect. (a) Mach Zehnder Interferometer (b) 3 dB coupler (c) Phase Shifter (d) Polarizer	1	1	5	3	3.2.2
9	..... integration is done for OEIC receiver. (a) Hybrid (b) Monolithic (c) Large Scale (d) Modular	1	2	5	3	3.2.2
10	The optical transmission depends on in an optical integrated circuits temperature sensor (a) boltzmann constant & refractive index (b) wavelength & velocity (c) effective refractive index & path length difference (d) path length difference & boltzmann constant.	1	1	5	3	3.2.2

Part – B
(4 x 10 = 40 Marks)
SECTION B1
Instructions: Answer ANY 2 Questions

11	(a) List out the conditions on which the Raman Nath and Bragg type diffraction takes place. Elaborate the type of acoustic modulator with multiple diffraction with a suitable diagram	5	4	4	1	1.3.1
	(b) A polarized optical beam is passed at 633nm from a LASER source through a 2 cm long ZnTe material-based rod and the magnetic field around the rod is 0.7T. What is the rotation of the optical field for verdet constant value of 65.8rad T ⁻¹ m ⁻¹ .	5	2	4	2	2.2.1
12	(a) Discuss the phase modulation technique in single waveguide Electro optic modulator	5	3	4	3	1.3.1
	(b) Suppose we generate 150MHz acoustic waves in a TeO ₂ crystal. Consider a LASER operating at a wavelength of 632.8nm with a acoustic velocity of 4.2x10 ³ m s ⁻¹ . Calculate the acoustic wavelength and the bragg diffraction angle.	5	4	4	2	2.2.1
13	(a) Analyze the Input-Output relation for a bistable system in an optical gate. Illustrate the bistable system as an AND gate.	5	4	4	3	3.2.1
	(b) Explain second harmonic generation in optical frequency doubling in a KDP crystal	5	2	4	3	1.3.1

SECTION B2						
Instructions: Answer ANY 2 Questions						
14	(a) What is the need for Integration? Describe the types of integration with the help of diagram.	5	2	5	1	1.4.1
	(b) With the help of schematic diagram of a four channel OEIC transmitter and the circuit diagram, explain the working of OEIC Transmitter.	5	4	5	4	4.2.1
15	(a) How a spectral analysis is done using a RF spectrum analyzer? Give an overall diagram of the spectrum analyzer.	5	3	5	1	1.4.1
	(b) Briefly explain about an integrated device which helps in detecting readout, focus/tracking error signals.	5	3	5	1	1.4.1
16	(a) Analyze the switching characteristics of a device with the following condition as Electric field of the input to one arm is unity and zero phase.	5	4	5	3	3.2.2
	(b) Draw and Explain OIC temperature sensor with suitable diagram.	5	2	5	3	3.2.2

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions



Approved by the Course Coordinator

Signature of the Question paper setter

Evaluation Sheet

Name of the Student:

Register No.:

Part- A (10 x 1= 10 Marks)					
Q. No	CO	PO	Maximum Marks	Marks Obtained	Total
1	CO4	PO1	1		
2	CO4	PO1	1		
3	CO4	PO1	1		
4	CO4	PO3	1		
5	CO4	PO1	1		
6	CO5	PO1	1		
7	CO5	PO1	1		
8	CO5	PO3	1		
9	CO5	PO3	1		
10	CO5	PO3	1		
Part- B (4 x 10= 40 Marks)					
11(a)	CO4	PO1	5		
11(b)	CO4	PO2	5		
12(a)	CO4	PO3	5		
12(b)	CO4	PO2	5		
13(a)	CO4	PO3	5		
13(b)	CO4	PO3	5		
14(a)	CO5	PO1	5		
14(b)	CO5	PO4	5		
15(a)	CO5	PO1	5		
15(b)	CO5	PO1	5		
16(a)	CO5	PO3	5		
16(b)	CO5	PO3	5		

Consolidated Marks:

CO	Maximum Marks	Marks Obtained
4	35	
5	35	
Total	70	

PO	Maximum Marks	Marks Obtained
1	26	
2	10	
3	29	
4	5	
Total	70	

Signature of the Course Teacher

Signature of the Course Coordinator

Signature of the Academic Advisor