Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

School of Engineering

Mid - Term Examinations - November 2024

Semester: V
Course Code: ECE3021
Course Name: Optoelectronic Materials
Program: B.Tech

Date: 07/11/2024
Time: 11.45am to 01.15pm
Max Marks: 50
Weightage: 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Qx2M=10M**

1	List out the different stages of free electron theory.	**2 Marks**	**L1**	**CO1**
2	State Drude-Lorentz theory of metals.	**2 Marks**	**L1**	**CO1**
3	Compare degenerative and non-degenerative semiconductors.	**2 Marks**	**L1**	**CO1**
4	What are linear dielectric materials?	**2 Marks**	**L1**	**CO1**
5	Differentiate coherent and non-coherent sources in interference.	**2 Marks**	**L1**	**CO2**

Part B

Answer ALL Questions. Each question carries 10 marks. **4QX10M=40M**

6	Electrical conductivity in solids measures how easily electric current can pass through a substance. Derive an expression for the electrical conductivity of solids using Newton's law of motion.	**10 Marks**	**L2**	**CO1**

Or

7	The seven crystal systems are a method of classifying crystals according to their atomic lattice or structure. The atomic lattice is a three-dimensional network of atoms arranged in symmetrical	**10 Marks**	**L2**	**CO1**

patterns. Represent all seven crystals with conventional unit cells neatly.

8	Capacitors use non-conducting materials or dielectric, to store charge and increase capacitance. Dielectrics when placed between charged capacitor plates, become polarized which reduces the voltage across the plate and increases the capacitance. Derive the expression of the effect of dielectrics in the capacitor.	**10 Marks**	**L2**	**CO1**
	Or			
9	Capacitance-voltage (C-V) characterization is used to analyze the electrical properties of dielectric materials, particularly in semiconductor devices like MOS capacitors. Explain the C-V characteristics of MOSFET in detail with different modes of operation**.**	**10 Marks**	**L2**	**CO1**
10	The basic principle of strained-layer epitaxy is that a certain amount of elastic strain can be accommodated by any material without generating dislocations or defects. Explain the strained epitaxial heterostructure in detail**.**	**10 Marks**	**L2**	**CO1**
	Or			
11	A quantum well is a region that confines electrons in a small region of space. Illustrate this concept using any heterostructure semiconductor in detail.	**10 Marks**	**L2**	**CO1**
12	A wave is a periodic oscillation that transmits energy through space. Light is a transverse, electromagnetic wave that can be seen by the typical human. Explain the properties and parameters of a light wave in detail.	**10 Marks**	**L2**	**CO2**
	Or			
13	Derive and explain the equation in quantum mechanics which allows us to find the wave function for a given situation and describe its time-independent equation.	**10 Marks**	**L2**	**CO2**