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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations –JANUARY 2025** |
| **Date:** 16 – 01- 2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** B. Tech ECE | |
| **Course Code :** ECE3021 | **Course Name** : Optoelectronic Materials | |
| **Semester**: V | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **19** | **19** | **41** | **21** | **-** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| **1** | Compare crystal and lattice. | **2 Marks** | **R** | **CO1** |
| **2** | Define a unit cell and mention its types. | **2 Marks** | **R** | **CO1** |
| **3** | Compare coherent and non-coherent sources in interference. | **2 Marks** | **R** | **CO2** |
| **4** | State Wien's displacement law. | **2 Marks** | **R** | **CO2** |
| **5** | What is called “director”? | **2 Marks** | **R** | **CO3** |
| **6** | Compare LED vs. LASER. | **2 Marks** | **R** | **CO3** |
| **7** | Define population inversion. | **2 Marks** | **R** | **CO3** |
| **8** | Define the term ‘sensitivity’. | **2 Marks** | **R** | **CO4** |
| **9** | Represent the output voltage relationship of the buck converter. | **2 Marks** | **R** | **CO4** |
| **10** | List any two applications for DC-to-DC converters. | **2 Marks** | **R** | **CO4** |

**Part B**

|  |  |  |  |  |  |  |
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| **Answer the Questions. Total Marks 80** | | | | | | |
| **11.** | **a.** | Write short notes on the following thermal detectors   1. Thermoelectric Detectors 2. Bolometer 3. Pneumatic Detectors 4. Pyroelectric Detectors | **20 Marks** | **U** | **CO3** |
| **or** | | | | | |
| **12.** | **a.** | Light (Photons) is a mysterious phenomenon that can behave like a wave or a particle, depending on how we observe it. Illustrate with an experiment how light and matter can display characteristics of both classically defined waves and particles along with conditions for sustained interference. | **20 Marks** | **U** | **CO3** |
|  |  |  |  |  |  |
| **13.** | **a.** | 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. | **15 Marks** | **U** | **CO1** |
| **or** | | | | | |
| **14.** | **a.** | 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, along with different modes of operation. | **15 Marks** | **U** | **CO1** |

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| **15.** | **a.** | Derive and explain the equation in quantum mechanics, allowing us to find the wave function for a given situation and describe its time-independent equation. | **15**  **Marks** | **U** | **CO2** |
| **Or** | | | | | |
| **16.** | **a.** | Explain how the PN junction diode behaves under three bias conditions and derive the Shockley diode equation in detail. | **15 Marks** | **U** | **CO2** |

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| **17.** | **a.** | Identify the optical instrument that emits through an optical amplification process based on the controlled discharge of electromagnetic radiation. which generates a very narrow and dense light beam and explain its principle, construction, working and applications with neat diagram. | **15**  **Marks** | **U** | **CO 3** |
| **Or** | | | | | |
| **18.** | **a.** | Explain the following photomultiplier configurations with their advantages   1. Venetian blind 2. Box/grid 3. Linear focused 4. Circular edge focused | **15**  **Marks** | **U** | **CO 3** |

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| **19.** | **a.** | A liquid crystal display (LCD) is a flat, thin display device that leverages technology to provide better picture quality. Explain LCD's working principle, construction, and working and compare it with light emitting diodes. | **15**  **Marks** | **U** | **CO 4** |
| **Or** | | | | | |
| **20.** | **a.** | Identify the type of DC-to-DC converter with an output voltage magnitude that is either greater or less than the input voltage magnitude. Justify with a real-time example. | **15**  **Marks** | **U** | **CO 4** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***