



# MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

I B.Tech I Sem Supply Examination, December 2021

## APPLIED PHYSICS

(ECE)

**Time: 3 Hours.**

**Max. Marks: 70**

Note: 1. This question paper contains two parts A and B.

2. Part- A is Compulsory. Answer all Questions which carries 20 marks.

3. Part – B consists 5 units. Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

### PART- A

**(10\*2 Marks=20Marks)**

- Find the ground state energy of an electron moving in one dimensional
1. a) potential well of width  $1\text{\AA}$  (Given that  $m = 9.11 \times 10^{-31} \text{ kg}$  &  $h = 6.63 \times 10^{-34} \text{ JS}$ ). 2M CO-1 BL-6
  - b) Explain drawbacks of Davisson and Germer experiment? 2M CO-1 BL-2
  - c) What are the uses of recombination process? 2M CO-2 BL-1
  - d) Draw V-I Characteristics of diode. 2M CO-2 BL-4
  - e) List out the materials which are used for fabrication of semiconductor laser. 2M CO-2 BL-4
  - f) What are the applications of LED? 2M CO-3 BL-1
  - g) Distinguish between population and population inversion. 2M CO-2 BL-4
  - h) The numerical aperture of an optical fiber is 0.39. If the difference in the refractive indices of the material of its core and cladding is 0.05. Calculate the refractive index of the material of the core. 2M CO-2 BL-5
  - i) Show that  $P = \epsilon_0 E (\epsilon_r - 1)$ . 2M CO-4 BL-4
  - j) If a magnetic field strength 300 amp/meter produces a magnetization of 4200 A/m in a ferromagnetic material. Find the relative permeability of the material. 2M CO-4 BL-6

### PART - B

**(5\*10 Marks=50Marks)**

#### UNIT-I

- 2 a) What is Compton effect? Explain in detail. 5M CO-1 BL-1
- b) Derive an expression for de-Broglie's hypothesis and explain its different forms. 5M CO-1 BL-6

#### OR

- 3 a) Illustrate the Davisson and Germer experiment to prove the wave nature for the matter. 5M CO-2 BL-2
- b) For a Particle in one dimensional box, Evaluate the Eigen values and Eigen function. 5M CO-2 BL-5

**UNIT-II**

- |   |    |   |    |      |      |
|---|----|---|----|------|------|
| 4 | a) | What is Hall effective? Derive an expression of Hall coefficient. | 5M | CO-2 | BL-6 |
|   | b) | Elaborate Zener diode and its V-I Characteristics.                | 5M | CO-2 | BL-6 |

**OR**

- |   |    |  |    |      |      |
|---|----|--|----|------|------|
| 5 | a) | Distinguish between Intrinsic and Extrinsic semiconductors   | 5M | CO-2 | BL-4 |
|   | b) | Derive an equation for Carrier generation and recombination. | 5M | CO-2 | BL-6 |

**UNIT-III**

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|---|----|---|----|------|------|
| 6 | a) | With neat diagram discuss construction and principle of Solar cell. | 5M | CO-3 | BL-6 |
|   | b) | Distinguish between Solar cell and PIN.                             | 5M | CO-3 | BL-4 |

**OR**

- |   |    |   |    |      |      |
|---|----|---|----|------|------|
| 7 | a) | Given an outline on Avalanche photo-detectors.                        | 5M | CO-3 | BL-2 |
|   | b) | Discuss working principle and characteristics of PIN photo-detectors. | 5M | CO-3 | BL-6 |

**UNIT-IV**

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|---|----|---|----|------|------|
| 8 | a) | With the help of suitable diagrams, discuss the principle, construction and working of Carbon dioxide laser | 5M | CO-2 | BL-6 |
|   | b) | Derive an equation for acceptance angle of fiber.   | 5M | CO-2 | BL-6 |

**OR**

- |   |    |   |    |      |      |
|---|----|---|----|------|------|
| 9 | a) | Explain the role of the active medium and optical resonators in a laser system. | 5M | CO-2 | BL-5 |
|   | b) | Explain the structure of different types of optical fiber with ray paths.       | 5M | CO-2 | BL-5 |

**UNIT-V**

- |    |    |   |    |      |      |
|----|----|---|----|------|------|
| 10 | a) | Write a note on differential form of Maxwell's equations. | 5M | CO-4 | BL-1 |
|    | b) | Derive an expression for Internal field.                  | 5M | CO-4 | BL-6 |

**OR**

- |    |    |  |    |      |      |
|----|----|--|----|------|------|
| 11 | a) | Write a note on Faraday's laws.                      | 5M | CO-4 | BL-1 |
|    | b) | Derive an expression for Clausius-Mossotti equation. | 5M | CO-4 | BL-6 |

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