

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech I Year I Semester Supplementary Examinations June-2024

SEMICONDUCTOR PHYSICS

(Common to CSE & CSIT)

Time: 3 Hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- | | | | | | |
|---|---|---|-----|----|----|
| 1 | a | Describe the electrical conductivity in a metal using quantum free electronic theory. | CO1 | L2 | 8M |
| | b | Write advantages quantum free electron theory over classical free electron theory. | CO1 | L1 | 4M |

OR

- | | | | | | |
|---|---|---|-----|----|----|
| 2 | a | Write brief note on Fermi Dirac distribution. | CO1 | L1 | 6M |
| | b | Explain the effect of temperature on Fermi Dirac distribution function. | CO1 | L2 | 6M |

UNIT-II

- | | | | | | |
|---|---|--|-----|----|-----|
| 3 | a | What is intrinsic semiconductor? | CO2 | L1 | 2M |
| | b | Derive the expression for intrinsic carrier concentration. | CO2 | L3 | 10M |

OR

- | | | | | | |
|---|---|---|-----|----|----|
| 4 | a | Describe the Hall Effect in a semiconductors. | CO2 | L2 | 8M |
| | b | Write the applications of Hall Effect. | CO2 | L2 | 4M |

UNIT-III

- | | | | | | |
|---|---|--|-----|----|----|
| 5 | a | Derive Schrödinger's time independent wave equation. | CO3 | L3 | 8M |
| | b | Explain the physical significance of wave function. | CO3 | L2 | 4M |

OR

- | | | | | | |
|---|---|---|-----|----|----|
| 6 | a | Describe wave & particle nature of matter waves | CO3 | L1 | 4M |
| | b | State and Explain Stoke's Theorem and Gauss's Theorem | CO3 | L2 | 8M |

UNIT-IV

- | | | | | | |
|---|---|---|-----|----|----|
| 7 | a | What is population inversion? | CO4 | L1 | 3M |
| | b | Describe the construction and working principle of Nd:YAG Laser . | CO4 | L2 | 9M |

OR

- | | | | | | |
|---|---|---|-----|----|----|
| 8 | a | What is the numerical aperture of an optical fibre and derive an expression for it. | CO4 | L3 | 8M |
| | b | An optical fibre has a numerical aperture of 0.20 and cladding refractive index of 1.59. Determine the refractive index of core and the acceptance angle for the fibre in water has a refractive index of 1.33. | CO4 | L3 | 4M |

UNIT-V

- | | | | | | |
|---|---|--|-----|----|----|
| 9 | a | Explain why surface area to volume ratio very large for nano materials? | CO5 | L2 | 8M |
| | b | Find the surface area to volume ratio of Sphere using surface area and volume calculation for the given radius is 5 meter? | CO5 | L3 | 4M |

OR

- | | | | | | |
|----|---|---|-----|----|----|
| 10 | a | What are the techniques available for synthesizing nanomaterials? | CO5 | L1 | 4M |
| | b | Explain ball milling technique for synthesis of nanomaterial? | CO5 | L2 | 8M |

*** END ***

- 8 Find Laplace Transform of periodic function $f(t)$ with period T , where **CO4 L3 12M**

$$f(t) = \begin{cases} \frac{4Et}{T} - E & 0 \leq t \leq T/2 \\ 3E - \frac{4E}{T}t, & T/2 \leq t \leq T \end{cases}$$

UNIT-V

- 9 a Evaluate $L^{-1} \left\{ \int_s^{\infty} \log \left(\frac{(u+1)}{(u+1)} \right) du \right\}$. **CO5 L1 6M**

- b Find the inverse Laplace transform of $\log \left(1 - \frac{a^2}{s^2} \right)$. **CO5 L2 6M**

OR

- 10 Use transform method to solve $y'' + 2y' + 5y = e^{-t} \sin t$, where **CO5 L2 12M**
 $y(0) = 1, y'(0) = 1$.

***** END *****