

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET - B

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - FEB 2023**

Semester : Semester I - 2022

Course Code : PHY1002

Course Name : Sem I - PHY1002 - Optoelectronics and Device Physics

Program : B.Tech - (All Programs)

Date : 21-FEB-2023

Time : 1.00PM - 4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

(10 X 2 = 20M)

1. In a semiconductor, if the temperature increases then the resistivity
a) Increases (CO1) [Knowledge]
b) Decreases
c) Remains same
d) Fluctuates
2. A superconducting material on being subjected to the critical magnetic field changes to
a) Critical conductor (CO1) [Knowledge]
b) A material with superconductivity
c) Normal state
d) Remains uninfluenced
3. The solar cell is called as
a) Photo Diode (CO2) [Knowledge]
b) Photo-Voltaic Cell
c) LED
d) Zener Diode

4. With forward bias to a p-n junction, the width of depletion layer
a) Decreases (CO2) [Knowledge]
b) Increases
c) Remains the same
d) None of the above
5. Which diode is used as a Voltage regulator?
a) Zener Diode (CO2) [Knowledge]
b) LED
c) Photo Diode
d) All
6. The physical nature exhibited by the radiation
a) Particle (CO3) [Knowledge]
b) wave
c) Neither particle nor wave
d) Both A & B
7. According to the de-Broglie, the wavelength of electron is larger if the momentum is
a) Smaller (CO3) [Knowledge]
b) Larger
c) Wavelength is independent of momentum
d) Infinity
8. Light exhibits what kind of wave motion?
a) Transverse (CO4) [Knowledge]
b) Turbulent
c) Longitudinal
d) Aperiodic
9. Which among the following is described by the concept of numerical aperture in an optical fibre?
a) Light collection (CO4) [Knowledge]
b) Light Scattering
c) Light Dispersion
d) Light Polarization
10. Which of the following is a unique property of laser?
a) Speed (CO4) [Knowledge]
b) Displacement
c) Coherence
d) Wavelength

PART B

ANSWER ALL THE QUESTIONS

(5 X 10 = 50M)

11. when a current-carrying conductor or a semiconductor is introduced to a perpendicular magnetic field, a voltage can be measured at the right angle to the current path. Name the effect and explain with a neat diagram.

(CO1) [Comprehension]

12. It is observed that a direct band gap-based p-n junction diode ($E_g > 1.8 \text{ eV}$) emits Infrared and visible light when it is forward biased with a suitable knee voltage. Identify the device and describe the principle and working of this device with a neat diagram. Mention how the band gap of this device to be changed if one is interested in blue light instead of red light.
(CO2) [Comprehension]
13. a) It is observed that the sub microscopic particles in motion exhibit wave properties. Identify the waves and discuss their properties.
b) Calculate the de Broglie wavelength associated with electrons if the accelerating voltage is 6000 V.
(CO3) [Comprehension]
14. a) Why the refractive index of the core is kept more compared to the refractive index of cladding in optical fiber? Explain the mechanism of light propagation through optical fiber with diagram. (6M)
b) calculate the critical angle for a given refractive index core and cladding at 1.48 and 1.46. (4M)
(CO4) [Comprehension]
15. a) Are there any conditions of LASER? If yes, what are they and explain it?
b) The ratio of population of two energy levels is 1.069×10^{-30} . The wavelength of light emitted at 628 nm . Calculate the temperature of the system. (5M)
(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

16. a) Name the principle in quantum mechanics to identify the uncertainty in position and momentum. explain it with a neat diagram.
b) SiC-based LED emits blue light of the wavelength of 450 nm then the band gap of LED will be
(CO3,CO2) [Application]
17. a) Identify the mechanisms involved in the emission of radiation in LASER and Conventional light sources and explain them with a neat diagram.
b) The ratio of population of two energy levels is 1.059×10^{-30} . The wavelength of light emitted at 638nm. Calculate the temperature of the system.
(CO4) [Application]