Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Make Up Examinations – December 2025

Date: 26 – 12- 2025 **Time:** 1.00pm to 04.00pm

School: SOE	**Program:** B.Tech	
Course Code: PHY1002	**Course Name:** Optoelectronics and Device Physics	
Semester: MK	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**24**	**24**	**26**	**26**	

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

(iii) Given ***: h = 6.625×10^{-34} Js; e =1.6×10^{-19} C; K = 1.38×10^{-23}; Jk-1; c = 3x10^{8} m/s***

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Mention two applications of Hall effect.	**2 Marks**	**L1**	**CO1**
2.	Define critical temperature for superconductors.	**2 Marks**	**L1**	**CO1**
3.	Write two differences between Zener diode and ordinary p-n Junction diode.	**2 Marks**	**L1**	**CO2**
4.	Mention the type of doping needed for making p-type semiconductor. Name the majority carrier in p-type semiconductor.	**2 Marks**	**L2**	**CO2**
5.	Calculate the de Broglie wavelength associated with an electron accelerated under a potential difference of 100V.	**2 Marks**	**L2**	**CO3**
6.	Mention two failures of classical theory of physics.	**2 Marks**	**L2**	**CO3**
7.	State Planck's Quantum theory.	**2 Marks**	**L1**	**CO3**
8.	Mention two important properties of LASER.	**2 Marks**	**L1**	**CO4**
9.	Mention four advantages of optical fiber communication system.	**2 Marks**	**L1**	**CO4**
10.	Mention the parts of optical fiber.	**2 Marks**	**L1**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Discuss Hall effect with the help of a neat diagram. Mention the formula for Hall voltage and Hall coefficient explaining the terms.	**10 Marks**	**L1**	**CO1**
	b.	A semiconducting crystal with 12 mm long, 5 mm wide and 1 mm thick has a magnetic density of 0.5 Wbm^{-2} applied perpendicular to largest faces. When a current of 25 mA flows lengthwise through the specimen, the voltage measured across its width is found to be 45 μV. What is the Hall coefficient of this semiconductor?	**5 Marks**	**L3**	**CO1**
	c.	Differentiate between intrinsic and extrinsic semiconductors.	**5 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	Explain the terms Conduction band, Valence band and forbidden energy gap. Explain with supporting diagrams how on the basis of energy band gap solids can be classified into conductor, semiconductor and insulator.	**10 Marks**	**L2**	**CO1**
	b.	Differentiate between Type I and Type II superconductors with suitable diagram.	**5 Marks**	**L2**	**CO1**
	c.	A superconducting tin has a critical temperature of 3.7 K and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K.	**5 Marks**	**L3**	**CO1**

13.	**a.**	Explain the principle, construction, and working of a solar cell with a neat diagram.	**10 Marks**	**L2**	**CO2**
	b.	A single solar cell (10 cm × 10 cm) produces a voltage of 0.5 V and a current up to 2.5 A. If the solar intensity is 800 W/m^2, find out the efficiency of the solar cell.	**5 Marks**	**L3**	**CO2**
	c.	Draw V-I characteristics of a normal p-n junction diode, mark knee voltage and breakdown voltage in graph and explain these two terms. What kind of breakdown is seen in this diode?	**5 Marks**	**L3**	**CO2**
		Or			
14.	**a.**	Identify the optical semiconductor device which emits light when voltage is applied. Explain its construction and working principle with suitable diagrams.	**10 Marks**	**L2**	**CO2**
	b.	It is observed that GaAsP has a bandgap of 1.875 eV and emits radiation when it is forward biased with suitable knee voltage. Find the wavelength of the radiation emitted.	**5 Marks**	**L3**	**CO2**

	c.	Write differences between zener diode and ordinary diode.	**5 Marks**	**L2**	**CO2**

15.	**a.**	State de Broglie's hypothesis. Derive an expression for de Broglie wavelength in terms of energy of the particle. Find de Broglie wavelength associated with electron accelerated by a potential difference of V volt.	**10 Marks**	**L2**	**CO3**
	b.	Mention the properties of matter waves.	**5 Marks**	**L1**	**CO3**
	c.	Calculate the energy of a neutron when it is associated with a de Broglie wavelength of 1 Å. Given mass of neutron is 1.674×10^{-27} kg.	**5 Marks**	**L3**	**CO3**
		Or			
16.	**a.**	State Heisenberg's uncertainty principle with relevant equation. A proton is located in a region of space with a position uncertainty of 2×10^{-14} m. Calculate the corresponding uncertainty in its momentum.	**10 Marks**	**L3**	**CO3**
	b.	Calculate the uncertainty in the momentum of an electron if uncertainty in its position is 1 Å.	**5 Marks**	**L2**	**CO3**
	c.	Calculate the momentum of an electron and the de Broglie wavelength associated with it if its kinetic energy is 1.5 KeV.	**5 Marks**	**L3**	**CO3**

17.	**a.**	Explain Stimulated absorption, Spontaneous emission and Stimulated emission of radiation with help of diagrams.	**10 Marks**	**L2**	**CO4**
	b.	Explain briefly the conditions for laser.	**5 Marks**	**L2**	**CO4**
	c.	The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light emitted at 330K.	**5 Marks**	**L3**	**CO4**
		Or			
18.	**a.**	Discuss point to point communication using optical fiber with suitable diagram.	**10 Marks**	**L2**	**CO4**
	b.	Explain the principle of optical fiber with neat diagram.	**5 Marks**	**L2**	**CO4**
	c.	The refractive indices of core and cladding of an optical fiber are 1.41 and 1.4 respectively. Find the numerical aperture and angle of acceptance.	**5 Marks**	**L3**	**CO4**