

Total No. of Questions – [4]

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PRN. No.	
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PAPER CODE	U114-304CS (Backlog)
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DECEMBER 2024 (Backlog) EXAM SEM-I

F.Y. B.Tech

(PATTERN 2023)

COURSE NAME: Physics

COURSE CODE: BS10234CS

Time: [2Hr]

[Max. Marks: 60]

(*) Instructions to candidates:

- 1) Use of scientific calculator is allowed
- 2) Use suitable data where ever required
- 3) All questions are compulsory. Solve any THREE sub questions from each question.

Que. No.	Question Description	Max. Marks	CO mapped	BT Level
Q1.	Solve any three sub questions from the following			
	A) Calculate the probability of finding an electron at energy 0.3 eV above and 0.3 eV below Fermi energy at 400 K. Given: $k=8.6 \times 10^{-5}$ eV/K.	[5]	CO1	Apply
	B) Illustrate Fermi-Dirac distribution function and describe its variation at $T=0K$ and $T>0K$.	[5]	CO1	Understand
	C) If the reverse saturation current $I_0 = 10$ pA for a Silicon diode, find the forward current at $T = 300K$ for an applied voltage of 0.5V and 0.6V.	[5]	CO1	Apply
	D) Using energy level diagram, explain working of P-N junction diode in forward and reverse bias.	[5]	CO1	Understand
Q2.	Solve any three sub questions from the following			
	A) A glass clad fiber is made with core glass of refractive index 1.52. The cladding is doped to give a fractional refractive index of 0.0006. Calculate (i) the cladding index (ii) the internal critical angle (iii) the numerical aperture (NA) and (iv) the maximum acceptance angle.	[5]	CO2	Apply
	B) Illustrate about dispersion occurs in optical fiber. Also sketch the schematic diagram which showing dispersion for Multi-mode step index fiber.	[5]	CO2	Understand
	C) Illustrate construction of Optical fiber with suitable diagram. Explain the terms – Refractive Index and Numerical Aperture.	[5]	CO2	Understand
	D) If the spectral width $\Delta\lambda=158 \text{ \AA}$ at $\lambda = 6500 \text{ \AA}$ for a red LED and for the optical fiber, the material dispersion. $(\lambda^2 \frac{d^2n_1}{d\lambda^2}) = 0.025$. What is the material dispersion for an optical fiber of length $L = 1$ km. Calculate the material dispersion if a laser with the same wavelength, but $\Delta\lambda = 1 \text{ \AA}$, is used. Calculate B_{max} .	[5]	CO2	Apply

Q3.	Solve any three sub questions from the following			
	A) Compare RTD and thermistor with the help of various parameters.	[5]	CO3	Understand
	B) Define following characteristics of sensors: i) Accuracy ii) Precision iii) Sensitivity iv) Drift v) Resolution	[5]	CO3	Apply
	C) Illustrate working principle of Hall sensor and list out its applications.	[5]	CO3	Understand
	D) If the resistance of a P_t resistor with $R_0 = 100\Omega$ at 0°C , what is its resistance at -50°C ? Given $A = 3.9083 \times 10^{-3} / ^\circ\text{C}$ and $B = -5.775 \times 10^{-7} / ^\circ\text{C}^2$. What is its sensitivity and temperature coefficient at -50°C ?	[5]	CO3	Apply
Q4.	Solve any three sub questions from the following			
	A) Calculate the de Broglie wavelength of an electron when accelerated through a potential difference of 10,000 volts.	[5]	CO4	Apply
	B) An infinite square well has a width of 1\AA . What is the fractional change in the lowest two permissible energies of an electron in this well if the width is increased to 2\AA ?	[5]	CO4	Apply
	C) Derive the expression for Schrodinger's Time Independent Wave Equation.	[5]	CO4	Understand
	D) Explain Heisenberg's Uncertainty Principle.	[5]	CO4	Understand