	P.E.S. COLLEGE OF ENGINEERING **(AN AUTONOMOUS INSTITUTE)** **CHH. SAMBHAJINAGAR- 431002** **Regular Summer Examination – 2026** **Course: F.Y.B. Tech. Branch : All Semester : II** **Subject Code & Name: BTPESB202T/A102T & Engineering Physics** **Max Marks: 60 Date:01/07/2026 Duration: 3 Hr.**	
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculators is allowed.* *4. Assume suitable data wherever necessary and mention it clearly.*	
		Mark
Q. 1	**Solve Any six of the following.**	**12**
A)	Write the definition of Reverberation time and State the equation. **Definition for Reverberation time** **Equation of Reverberation time :** $\boldsymbol{T = \frac{0.165\,V}{\sum as} = \frac{0.165\,V}{A}}$	**1** **1**
B)	State the equation for natural frequency of crystal and frequency of oscillatory circuit in the production of Ultrasonic waves. **Natural frequency of crystal :** $\boldsymbol{f = \frac{1}{2t}\sqrt{\frac{Y}{\rho}}}$ **Frequency of oscillatory circuit :** $\boldsymbol{f = \frac{1}{2\pi\sqrt{LC}}}$	**1** **1**
C)	Define Pumping and mention types of pumping. **Definition of Pumping** **Types of pumping**	**1** **1**
D)	State the conditions for total internal reflection in core of an optical fiber 1) **The refractive index of core n_1 must be greater than refractive index of cladding n_2** **2) At core-cladding interface the angle incidence must be greater than θ_c defined by** $\boldsymbol{sin\,\theta_c = \frac{n_2}{n_1}}$	**1** **1**
E)	What is the relation between lattice parameters a, b, c and α, β, γ in cubic structure? $\boldsymbol{a = b = c}$ $\boldsymbol{\alpha = \beta = \gamma = 90°}$	**1** **1**

F)	What is doping in semiconductors? Define donor impurity and acceptor impurity. **Definition of doping** **Donor Impurity** **Acceptor impurity**	 **1** **1**
G)	Define diamagnetism. Give one example of a diamagnetic material. **Diamagnetism definition** **Example**	 **1** **1**
H)	Write the Conditions of maxima and minima for reflected system in terms of path difference **Condition for Minima** $\Delta x = (2n \pm 1)\frac{\lambda}{2}$ **Condition for Maxima** $\Delta x = n\lambda$	 **1** **1**
I)	What is significance of De-broglie Hypothesis. **Any two points**.	 **2**
Q.2	**Solve Any Two of the following.**	**12**
A)	Describe the important factors affecting architectural acoustics and their remedies. **Any three factors affecting the architecture acoustics and their remedies**	 **3+3**
B)	Explain the properties and Applications of Ultrasonic Waves **Properties of Ultrasonic waves** **Applications of Ultrasonic waves**	 **3** **3**
C)	Explain Magnetostriction effect. **Statement of Magnetostriction effect** **Figure and formula** A quartz crystal of thickness 2.2×10^{-3} m 3m has density 2.7×10^{3} kgm^{-3} and Young's modulus 8.2×10^{10} Nm^{-2}. Find its frequency of oscillation. **Formula :** $f = \frac{1}{2t}\sqrt{\frac{Y}{\rho}}$ **Calculation (Steps)** **Answer: 1.25×10^{6} Hz = 1.25 MHz**	 **1** **1** **1** **2** **1**
Q. 3	**Solve Any Two of the following.**	**12**
A)	Compare Spontaneous Emission and Stimulated Emission using suitable diagrams.	

	Comparison of Spontaneous Emission and Stimulated Emission with **1) Definition** **2) Well labelled Figures** **3) Any two comparisons**	 **2** **2** **2**
B)	Define Acceptance angle and Derive the expression for Acceptance angle with suitable figure. **Acceptance angle** **1) Definition** **2) Well labelled figures** **3) Step wise Derivation** **4) Final formula : $\theta_a = \sin^{-1}\sqrt{(n_1^2 - n_2^2)}$ OR $\theta_a = \sin^{-1}(NA)$**	 **1** **1** **3** **1**
C)	Define Diamagnetism, Paramagnetism, and Ferromagnetism. Compare their magnetic properties with suitable examples. **Definition and example of Diamagnetism** **Definition and example of Paramagnetism** **Definition and example of Ferromagnetism** **Comparison of magnetic properties any three (susceptibility, behavior in magnetic field, retentivity, permeability, etc.)**	 **1** **1** **1** **3**
Q.4	**Solve Any Two of the following.**	**12**
A)	Describe the step-by-step method used to determine Miller indices for a given lattice plane. with a suitable example. **Step-by-step procedure for determining Miller indices** **Suitable numerical/example with calculation steps** **Final correct Miller indices / neat presentation**	 **3** **2** **1**
B)	Compare the following properties of the α, β and γ particles Nature, Mass, Charge, Ionization potential, Penetration depth, Emission characteristics with suitable examples. **Introduction/definition of α, β and γ radiations** **Comparison of Nature, Mass and Charge** **Comparison of Ionization power and Penetration power** **Emission characteristics with suitable examples**	 **1** **2** **1** **2**
C)	The refractive indices of the core and cladding of an optical fibre are 1.52 and 1.47 respectively. Find: (i) Critical angle at core-cladding interface (ii) Numerical aperture (iii) Acceptance angle. **(i) Critical angle at core-cladding interface**	

	Writing formula $sin\theta_c = \frac{n_2}{n_1}$ **OR** $\theta_c = \sin^{-1}(\frac{n_2}{n_1})$	**1**
	Calculation and correct answer : $\theta_c = 75.3$	**1**
	(ii) Numerical aperture	
	Writing formula : $NA = \sqrt{(n_1^2 - n_2^2)}$	**1**
	Calculation and correct answer : $NA = 0.387$	**1**
	iii) Acceptance angle	
	Writing formula : $NA = sin\,\theta_a$ **OR** $\theta_a = \sin^{-1}(NA)$	**1**
	Calculation and correct answer : $\theta_a = 22.8°$	**1**
Q. 5	**Solve Any Two of the following.**	**12**
A)	Derive the expression for the diameter of Newton's dark rings.	
	Introduction and suitable explanation	**1**
	Diagram with notation	**1**
	Stepwise derivation for Newton's dark rings	**3**
	Final expressions $D_n^2 = 4n\lambda R$	**1**
B)	Derive Schrödinger's time-independent wave equation.	
	Introduction and suitable explanation	**1**
	Differential wave equation	**1**
	Stepwise derivation	**3**
	Final Schrödinger time-independent equation $\nabla^2\Psi + \frac{2mE}{\hbar^2}\Psi = 0$	**1**
C)	Define charge carriers in semiconductors. Explain electron mobility and hole mobility and discuss the factors affecting mobility.	
	Definition of charge carriers	**1**
	Explanation of electron mobility	**1**
	Explanation of hole mobility	**1**
	Factors affecting mobility	**2**
	Suitable equations/examples/conclusion	**1**
	***** End *****	