Q.6	i.	What are extrinsic semiconductors? What are its kinds?	**3**	01	01	01	
	ii.	State the first law of thermodynamics, explaining the meaning of the symbols used, hence explain isothermal and adiabatic process.	**7**	02	02	01	
OR	iii.	Explain reversible and irreversible process with suitable example.	**7**	02	02	01	

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
EN3BS10 Physics for Computing Science

Programme: B.Tech. Branch/Specialisation: CSBS

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**CO**	**PO**	**PSO**
Q.1	i.	To perform lasing action in a laser, large number of atoms must remain in- (a) Ground state (b) Metastable state (c) Normal state (d) Excited state	**1**	01	03	01	
	ii.	What is the active centre in a Nd: YAG laser? (a) Yttrium Aluminium Garnet (b) Carbon dioxide (c) Neodymium ions (d) Ruby	**1**	01	03	01	
	iii.	A calcite crystal is placed over a dot on a place of paper and rotated. On seeing through the calcite one will see- (a) Two rotating dots (b) One dot only (c) Two stationary dots (d) One dot rotating on the other	**1**	02	02	01	
	iv.	In a Fresnel's biprism experiment, the distance between the two virtual coherent sources is 0.4 mm and the distance between the source and the screen is 2 m. If the wavelength of light used is 500 nm, what is the fringe width? (a) 0.25 mm (b) 0.5 mm (c) 1.0 mm (d) 2.5 mm	**1**	03	04	02	

v.	The de-Broglie wavelength is associated with: (a) Light waves only (b) All matter (c) Sound waves (d) Electromagnetic waves	**1**	01	01	01
vi.	If a=10.8 Å, b= 9.47 Å, c = 5.2 Å, $\alpha=41^0$, $\beta=83^0$ and $\gamma=93^0$, the crystal structure is: (a) Triclinic (b) Cubic (c) Orthorhombic (d) Trigonal	**1**	02	01	01
vii.	The vector field F is solenoidal if- (a) $\vec{\nabla} \times \vec{F} = 1$ (b) $\vec{\nabla} . \vec{F} = 0$ (c) $\vec{\nabla} \times \vec{F} = 0$ (d) $\vec{\nabla} . \vec{F} = 1$	**1**	02	04	01
viii.	Which of the following is a simple harmonic motion? (a) Particle moving in a circle with uniform speed (b) Wave moving through a string fixed at both ends (c) Earth spinning about its axis (d) Ball bouncing between two vertical walls	**1**	02	01	01
ix.	Kelvin Planck's law deals with- (a) Conservation of heat into work (b) Conservation of heat (c) Conservation of work (d) Conservation of work into heat	**1**	02	02	01
x.	A temperature difference of 10°C, on thermodynamic scale is equal to: (a) 263K (b) 283K (c) 273K (d) 10K	**1**	03	02	02
Q.2 i.	If the coefficient of stimulated emission is 1.0×10^{-8} cm^3/s for a transition at the wavelength 500 nm. Calculate the corresponding coefficient of spontaneous emission.	**3**	03	04	02
ii.	Sketch a schematic diagram of the Ruby laser and mention the major components. Explain the pumping and lasing processes using energy level diagram.	**7**	02	03	01

OR	iii.	Explain the concepts of acceptance angle, acceptance cone and numerical aperture in optical fibers. Derive the expression for the acceptance angle.	**7**	02	03	01
Q.3	i.	A beam of monochromatic light strikes a glass surface at an angle of incidence of 30°. The refractive index of the glass is 1.5. Calculate the angle at which the reflected light is completely polarized.	**3**	03	02	02
	ii.	Write three differences between Fresnel's and Fraunhofer's diffraction. Obtain the expression for the intensity distribution due to Fraunhofer's diffraction at a single slit.	**7**	02	02	01
OR	iii.	Explain Newton's rings experiment and derive the expression for the radius of the n^{th} dark ring.	**7**	02	04	01
Q.4	i.	A proton with a mass of 1.67×10^{-27} kg is confined to a region of space with an uncertainty in position 2×10^{-14} m. Calculate the minimum uncertainty in the proton's momentum.	**3**	03	04	02
	ii.	Obtain eigen function with the help of Schrödinger's wave equation for a particle enclosed in a one-dimensional box and prove that the energy eigen values of the particle is discrete.	**7**	02	02	01
OR	iii.	Starting from the wave equation and introducing energy and momentum of the particle, obtain an expression for one dimensional Schrodinger's equation in time dependent form.	**7**	02	02	01
Q.5	i.	What are Maxwell's equations? Write down their differential form.	**3**	01	02	01
	ii.	What is Simple harmonic motion? Derive a general equation of motion for a simple harmonic oscillator and obtain its solution.	**7**	02	01	01
OR	iii.	Explain the following terms with suitable example- (a) Resonance (b) Damped oscillation	**7**	02	01	01

Marking Scheme

EN3BS10 (T) Physics for Computing Science (T)

Q.1	i)	b) metastable state	**1**
	ii)	c) Neodymium ions	**1**
	iii)	d) one dot rotating on the other	**1**
	iv)	d) 2.5 mm	**1**
	v)	b) All matter	**1**
	vi)	a) triclinic	**1**
	vii)	b) $\vec{\nabla} . \vec{F} = 0$	**1**
	viii)	b) Wave moving through a string fixed at both ends	**1**
	ix)	a) conservation of heat into work	**1**
	x)	d) 10K	**1**
Q.2	i.	Correct Formula 1M Remaining calculation 2M	**3**
	ii.	Block diagram 1M Energy level diagram 2M Pumping 2M Lasing process 2M	**7**
OR	iii.	Acceptance angle 1M Acceptance cone 1M Numerical aperture 1M Derivation 4M	**7**
Q.3	i.	Correct Formula 1M Remaining calculation ($\tan\theta p=n$: Ans. = 56.3) 2M	**3**
	ii.	Differences 3M Diagram 1M Expression for the intensity 3M	**7**
OR	iii.	Experimental arrangement with diagram 3M Derivation 4M	**7**
Q.4	i.	Correct Formula 1M Remaining calculation 2M	**3**
	ii.	Boundary Condition and equation 2M Value of constant ‘B’ 2M	**7**
		Energy eigen value 2M Explanation of discrete nature 1M	
OR	iii.	Wave equation 2M Diff. w. r. to ‘x’ 2M Total energy 1M Final expression 2M	**7**
Q.5	i.	What are Maxwell’s equations? 1M Differential form 2M	**3**
	ii.	What is Simple harmonic motion? 1M Upto the diff eq. of SHM 3M Solution of equation 3M	**7**
OR	iii.	Resonance with example 3.5M Damped oscillation with example 3.5M	**7**
Q.6	i.	Extrinsic semiconductors 1M Its kinds 2M	**3**
	ii.	First law of thermodynamics 2M Isothermal process 2.5M Adiabatic process 2.5M	**7**
OR	iii.	Reversible process with suitable example. 3.5M Irreversible process with suitable example. 3.5M	**7**

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P.T.O.