

Enrollment No.....



Faculty of Engineering / Science

End Sem Examination May-2024

EN3BS16 / BC3BS06 / SC3BS05 Engineering Physics

Programme: B.Tech./ B.Sc.

Branch/Specialisation: All

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.

- Q.1 i. The concept of wave packet has been given by- **1**
 (a) Germer (b) Schrodinger (c) Davisson (d) Einstein
- ii. The wave function of the particle in a box of length 'L' lies in which region? **1**
 (a) $0 > x < L$ (b) $x < 0 > L$ (c) $0 < x < L$ (d) $x > L > 0$
- iii. Uni-axial crystals are of- **1**
 (a) Three types (b) Two types
 (c) Four types (d) One type
- iv. Polarization shows light waves nature is- **1**
 (a) Transverse (b) Longitudinal (c) Linear (d) Nonlinear
- v. The device which is used to obtain q/m ratio of the particle is- **1**
 (a) LINAC (b) Cyclotron
 (c) G. M. Counter (d) Bainbridge mass spectrograph
- vi. The magic numbers are- **1**
 (a) 2, 6, 18, 28, 72 (b) 2, 6, 20, 28, 36
 (c) 2, 8, 20, 28, 50 (d) 2, 8, 18, 32, 50
- vii. What is the coordination number of a simple cubic structure? **1**
 (a) 6 (b) 8 (c) 10 (d) 12
- viii. The interaxial angles of a triclinic crystal system are given by- **1**
 (a) $\alpha = \beta = \gamma = 90^\circ$ (b) $\alpha = \beta = 90^\circ$ $\gamma = 120^\circ$
 (c) $\alpha = \beta = \gamma \neq 90^\circ$ (d) $\alpha \neq \beta \neq \gamma \neq 90^\circ$
- ix. The wavelength of He-Ne laser is- **1**
 (a) 6328 Å (b) 6943 Å (c) 6000 Å (d) 6200 Å
- x. In an optical fibre light propagates in the- **1**
 (a) Core (b) Buffer (c) Cladding (d) Air

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- Q.2 i. X-rays of 1 Angstrom scattered from a carbon block. Find the wavelength of the scattered beam in a direction making an angle 90° with the incident beam. **3**
- ii. Obtain time dependent and time independent Schrodinger's wave equations. **7**
- OR iii. Distinguish between phase velocity and group velocity of a wave packet. State uncertainty principle and establish relation between them. **7**
- Q.3 i. Distance between the two virtual coherent sources in biprism is 0.1 mm and the width of the fringes formed on the screen is 5 mm. If the distance between the screen and the slit is one meter, what would be the wavelength of light used? **3**
- ii. Derive an expression for the intensity due to single slit diffraction. Show that the intensity at first secondary maxima is about 4.5 % of that of principal maxima. **7**
- OR iii. Make a neat and clean diagram of Newton's ring set up. Why circular fringes are formed in this setup? Prove that diameter of n^{th} dark fringe is proportional to the square root of natural number. **7**
- Q.4 i. A cyclotron with a magnetic field $B=2 \text{ W/m}^2$ is used to accelerate proton. Calculate the frequency of the oscillator connected across the dees. **3**
- ii. Explain the principle, construction and working of Betatron and derive the condition for its operation. **7**
- OR iii. Explain the principle, construction and working of G. M. Counter. What is dead time? How quenching is achieved in it? **7**
- Q.5 i. In a triclinic crystal, a lattice plane makes intercepts at a length a, 2b and $-3c/2$. Find the miller indices of the plane. **3**
- ii. What is Hall Effect? Derive the expression of hall coefficient. **7**
- OR iii. What is Meissner effect? Distinguish between Type-I and Type-II superconductors. **7**
- Q.6 i. The refractive indices of core & cladding materials of step index fibre are 1.48 & 1.45 respectively. Calculate- **3**
 (a) Numerical operator (b) Acceptance angle
- ii. Derive the expression for Einstein's A and B coefficients. Why it is difficult to build up laser in X-ray region. **7**
- OR iii. With the help of block diagram and energy level diagram explain the construction and working of any gaseous laser. **7**

Marking Scheme

EN3BS16 / BC3BS06 / SC3BS05 (T) -Engineering Physics (T)

Q.1	i)	B	1
	ii)	C	1
	iii)	B	1
	iv)	A	1
	v)	D	1
	vi)	C	1
	vii)	A	1
	viii)	D	1
	ix)	A	1
	x)	A	1
Q.2	i.	Correct Formula	1
		Remaining calculation (Ans. = 1.024 Angstrom)	2
	ii.	Time dependent Schrodinger's wave equation	3.5
		Time independent Schrodinger's wave equation	3.5
OR	iii.	Phase velocity	2
		Group velocity	2
		Uncertainty principle	3
Q.3	i.	Correct Formula	1
		Remaining calculation (Ans. = 5000 Angstrom)	2
	ii.	Diagram	1
		Expression upto the resultant intensity	2
		Condition for principle maxima and minima	2
		Condition for secondary maxima	2
OR	iii.	experimental arrangement+Diagram	2
		rings are circular in nature	1
		Derivation	4
Q.4	i.	Correct Formula	1
		Remaining calculation (Ans. = 30 MHz)	2
	ii.	Diagram and principle	2
		Construction and working	2
		Condition	3
OR	iii.	Diagram and principle	2
		Construction and working	3

		Dead time	1
		Quenching	1
Q.5	i.	Correct Steps	2
		Correct Ans.= $(6 \ 3 \ \bar{4})$ or $(6 \ 3 - 4)$	1
	ii.	Diagram and Hall Effect definition	3
		Derivation of Hall coefficient.	4
OR	iii.	Meissner Effect	3
		Difference between Type-I and Type-II superconductors (At least 4)	4
Q.6	i.	Correct Formulas & Answer of NA & Acceptance 1.5 each	3
		Remaining calculation (Ans. $n_1 = 1.424$; $n_2 = 1.407$; $\theta = 12.71^\circ$)	
	ii.	Derivation upto three quantum processes	2
		Remaining derivation	3
		Reason for (X-ray region)	2
OR	iii.	block diagram	1
		energy level diagram	2
		construction	2
		working	2
