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Q.6	i. What is the role of He atoms in He-Ne laser?	2	2	2	1
	ii. Write any three demerits of copper cables over optical fibres.	3	2	2	1
	iii. Describe the construction Ruby laser and write its 2 demerits.	5	2	2	1
OR	iv. An optical fibre has refractive index of core to be 1.5 and the refractive index difference of core-cladding to be 0.0005. Determine numerical aperture and acceptance angle.	5	2	2,4	1

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Total No. of Questions: 6

Total No. of Printed Pages:4

Enrollment No.....



Faculty of Engineering / Science

End Sem Examination Dec 2024

EN3BS16 / SC3BS05 / BC3BS06 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.

		Marks	BL	PO	CO	PSO
Q.1	i. Which one of the following objects moving at the same speed is associated with a smallest wavelength?	1	1	1	1	
	(a) Neutron (b) Bowling ball					
	(c) Electron (d) Proton					
	ii. The relation between phase velocity $v_p$ and group velocity $v_g$ if the medium is non dispersive:	1	1	2	1	
	(a) $v_p = v_g$ (b) $v_p > v_g$					
	(c) $v_p < v_g$ (d) None of these					
	iii. When a monochromatic light is replaced by white light in Fresnel's biprism experiment, the central fringe colour becomes:	1	2	2	1	
	(a) Dark					
	(b) White					
	(c) Coloured					
	(d) Colour changes from violet to red					
	iv. The criterion of resolution by diffraction gratings was given by:	1	1	1	1	
	(a) Newton (b) Huygen					
	(c) Rayleigh (d) Ramsden					

P.T.O.

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v.	What type of voltage is applied to the D shape disc of the cyclotron?	1	2	2	1
	(a) High frequency direct voltage				
	(b) Low frequency direct voltage				
	(c) High frequency alternating voltage				
	(d) Low frequency alternating voltage.				
vi.	The working principle of betatron is based on:	1	2	2	1
	(a) Lorentz magnetic force & electromagnetic induction				
	(b) Lorentz electric force & electromagnetic induction				
	(c) Mutual induction and self induction				
	(d) Biot–Savart law				
vii.	The maximum packing fraction in a cubic crystal is:	1	2	2	1
	(a) 0.74 (b) 2 (c) 4 (d) 1				
viii.	In an intrinsic semiconductor the Fermi level is:	1	2	2	1
	(a) Close to valence band				
	(b) Close to conduction band				
	(c) Middle of conduction and valence band				
	(d) None of these				
ix.	The pumping scheme in ruby laser is-	1	2	2	1
	(a) 2 level (b) 3 level				
	(c) 4 level (d) 1 level				
x.	In an optical fibre, the concept of numerical aperture is applicable in describing the ability of light:	1	2	2	1
	(a) Collection (b) Scattering				
	(c) Dispersion (d) Polarisation				
Q.2	i. Define and draw a wave packet for a moving particle associated with a group of waves.	2	2	2	1
	ii. If the diameter of the nucleus is $8.5 \times 10^{-14}$ m, calculate the minimum uncertainty in the momentum of a proton.	3	3	4	1

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	iii.	Write expression for Compton shift and give the experimental arrangement of Compton effect. Why is it not observed in visible light?	5	2	2	1
OR	iv.	Derive the expressions for energy and momentum operators.	5	2	1,4	1
Q.3	i.	Write any two differences between $e$ -ray and $o$ -ray in a doubly refracting crystal.	2	2	2	1
	ii.	In Newton's ring experiment diameter of $n^{\text{th}}$ ring and $(n+1)^{\text{th}}$ rings are 4.2mm and 7.0mm respectively. Radius of curvature of plano convex lens is 1m. Calculate wavelength of light.	3	3	4	2
	iii.	Obtain the intensity expression for a single slit fraunhofer diffraction pattern using neat and clean diagram.	5	2	2	1
OR	iv.	Give the construction and working of Fresnel's bi prism.	5	2	2	1
Q.4	i.	Explain the semi-empirical mass formula and write various term used.	3	2	2	1
	ii.	Give the principle, construction and working of LINAC.	7	2	2	1
OR	iii.	Give the principle, construction and working of Bainbridge Mass Spectrograph.	7	2	2	1
Q.5		Attempt any two:				
	i.	What do you mean by Meissner effect? Show that superconductors in the Meissner state exhibit perfect diamagnetism.	5	2	3	1
	ii.	What are Miller indices? Find the Miller indices if the lattice planes of a crystal have intercepts 2a, 3b, and 6c on the axes.	5	2	4,3	1
	iii.	What is Hall effect? Derive the expression for hall coefficient.	5	2	3	1

**Marking Scheme**  
**EN3BS16 (T) Engineering Physics (T)**

Q.1	i)	b) bowling ball	1
	ii)	a) $v_p = v_g$	1
	iii)	b) white	1
	iv)	c) Rayleigh	1
	v)	c) high frequency alternating voltage	1
	vi)	a) Lorentz magnetic force & electromagnetic induction	1
	vii)	a) .74	1
	viii)	c) middle of conduction and valence band	1
	ix)	b) 3 level	1
	x)	a) collection	1
Q.2	i.	Definition 1M diagram 1M	2
	ii.	Formula 1M substitution 1M answer = $6.21 \times 10^{-22}$ gm. 1M	3
	iii.	Experimental arrangement 2M Expression for Compton shift 2M reason 1M	5
	OR iv.	Energy operator 2.5M momentum operator derivation 2.5M	5
Q.3	i.	2 differences 1 mark each	2
	ii.	Formula 1M substitution 1M answer = $7.84 \times 10^{-3}$ mm 1M	3
	iii.	Figure 1M Resultant amplitude 3M intensity expression 1M	5
	OR iv.	Construction 2.5M working 2.5M	5
Q.4	i.	Formula 1M individual terms explanation 2M	3
	ii.	Principle 2M construction 2M	7

OR	iii.	working 3M Principle 2M construction 2M working 3M	7
	Q.5 i.	Definition of Meissner effect 2M to show perfect diamagnetism 2M diagram 1M	5
	ii.	Definition 2M finding Miller indices 3M	5
Q.6	iii.	Definition 2M derivation + diagram 3M	5
	i.	ROLE 2M	2
	ii.	Each demerit 1 mark	3
	iii.	Construction 3M demerit 2M	5
	iv.	Formula 1M NA 2M acceptance angle ( $NA=0.0474$ ) ( $Q_o = 2.72^0$ ) 2M	1+2+2

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