Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

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.

Q.1 i. Resonating cavity in a laser design helps- **1**

(a) Create population inversion
(b) Create a three-level laser beam
(c) Create an amplified coherent lasing beam
(d) None of these

ii. A step index fibre has a core of refractive index 1.5 and cladding of refractive index 1.48 the critical angle of the fibre is- **1**

(a) 80.63^0 (b) 14.13^0 (c) 28.26^0 (d) 67^0

iii. What happens if the ordinary unpolarized light is passed through a uniaxial crystal? **1**

(a) Light is split into two rays
(b) Light remains unaffected
(c) Light is split into more than two rays
(d) None of these

iv. The tip of a needle does not give a sharp image on the screen this is due to the fact- **1**

(a) Interference (b) Diffraction
(c) Polarization (d) Refraction

v. In hexagonal crystal the angles between the axis are- **1**

(a) $\alpha=\beta=\gamma=90^0$ (b) $\alpha\neq\beta\neq\gamma\neq90^0$
(c) $\alpha=\beta=90^0, \gamma=120^0$ (d) $\alpha=\gamma=90^0\neq\beta$

vi. The packing fraction has maximum value for- **1**

(a) FCC structure (b) SC structure
(c) BCC structure (d) None of these

P.T.O.

vii. The potential energy of a particle executing S.H.M. is maximum at- **1**
(a) Position of one third of amplitude
(b) Equilibrium position
(c) Midway (between zero and maximum)
(d) Extreme position

viii. The unit of spring constant in SI system of units is- **1**
(a) Nm^2 (b) Nm^{-1} (c) Nm^{-2} (d) Nm

ix. According to band theory a solid is characterized by- **1**
(a) The conduction and valence bands
(b) Only the conduction band
(c) Only the valence band
(d) None of these

x. Which of the following engines is the most efficient? **1**
(a) Gasoline engine (b) Diesel engine
(c) Steam engine (d) Carnot engine

Q.2 i. Explain the difference between step index and graded index fibre. **3**

ii. With the help off necessary diagram and energy level diagram explain the construction and working of ruby laser. **7**

OR iii. Explain the term absorption, spontaneous and stimulated emission of radiation. What are the characteristics of laser beam? **7**

Q.3 i. A parallel beam of monochromatic light is normally incident on a plane transmission grating having 12000 lines per centimetre. The second order spectral line is observed at an angle 45^0. Find the wavelength of light used. **3**

ii. Describe Fresnel's biprism. Derive the expression for the fringe width. How will you measure the wavelength of monochromatic light using biprism method? **7**

OR iii. Derive an expression for the intensity distribution due to fraunhofer diffraction at a single slit and show that intensity of the first subsidiary maxima is about 4.5 % of that of the principal maximum. **7**

Q.4 i. What is Planck's quantum hypothesis? **2**

ii. An electron has a momentum 5.4×10^{-26} kg.m/sec with an accuracy of 0.05%. Find the minimum uncertainty in the location of the electron. **3**

iii. Derive time dependent Schrodinger's wave Equation. **5**

OR iv. What are the conditions and limitations that the wave function must obey? Compute the energy of the lowest three levels for an electron in a square well of width 3 Å. **5**

Q.5 Attempt any two:

i. What are damped vibrations? Establish the differential equation of motion for a damped harmonic oscillator for overdamped condition. **5**

ii. Show that for a particle executive S.H.M. the average values of kinetic and potential energies are the same and each is equal to half of the total energy. **5**

iii. What are Maxwell's equations? Write down their differential and integral form with physical significance. **5**

Q.6 Attempt any two:

i. Draw neat energy level diagrams of conductors insulators and semiconductors and distinguish between them. **5**

ii. Write short note on entropy and second law of thermodynamics. **5**

iii. What is first law of thermodynamics? Explain it with the help of an example. **5**

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Marking Scheme

EN3BS10 Physics for Computing Science

Q.1	i	c) create an amplified coherent lasing beam.	**1**
	ii	a) 80.63^0	**1**
	iii	a) light is split into two rays	**1**
	iv	b) diffraction	**1**
	v	c) $\alpha=\beta=90^0, \gamma=120^0$	**1**
	vi	a) FCC structure	**1**
	vii	d) extreme position	**1**
	viii	b) Nm^{-1}	**1**
	ix	a) the conduction and valence bands	**1**
	x	d) Carnot engine.	**1**
Q.2	i	step index fibre graded index fibre	**1.5** **1.5**
	ii	Block diagram Eenergy level diagram Active medium + Active Centre + Correct wavelength Construction working	**1.5** **1.5** **1** **1.5** **1.5**
OR	iii	absorption, spontaneous and stimulated emission of radiation. (1.5 mark each) characteristics of laser beam	**4.5** **2.5**
Q.3	i	Correct Formula: $(e+d)\sin\Theta = n\lambda$ Solution of the numerical Ans.= 2946 Å	**1** **1.5** **0.5**
	ii	Description of Fresnel's biprism. Derivation of the fringe width. wavelength determination using biprism method?	**1.5** **4** **1.5**
OR	iii	Diagram Derivation upto the main intensity expression Derivation upto the condition of principle maxima and minima Remaining part	**1** **3** **1.5** **1.5**

Q.4	i	Planck's Quantum hypothesis Planck's radiation formula	**1.5** **0.5**
	ii	Correct formula: $\Delta x.\Delta p = h/4\pi$ Solution of the numerical Ans. 1.952×10^{-6} m	**1** **1.5** **0.5**
	iii	Derivation upto the differentiation with respect to time and position Remaining part.	**3** **2**
OR	iv.	Conditions and limitations of the wave function Correct formula : $En = n^2h^2 / 8mL^2$ Solution of the numerical Ans. $E1 = 6.6 \times 10^{-19}$ J $E2 = 26.78 \times 10^{-19}$ J $E3 = 59.4 \times 10^{-19}$ J	**2** **1** **1.5** **0.5**
		Attempt any two	
Q.5	i.	What are damped vibrations General differential equation of motion for a damped harmonic oscillator for overdamped condition.	**1** **3** **1**
	ii.	Expression upto the total energy term Expression upto the average P.E. Expression upto the average K.E.	**2** **1.5** **1.5**
	iii	What are Maxwell's equations Differential and integral form with physical significance (1 mark each)	**1** **4**
		Attempt any two	
Q.6	i.	Energy level diagrams Difference between conductors insulators and semiconductors	**1.5** **3.5**
	ii.	short note on entropy short note on second law of thermodynamics.	**2.5** **2.5**
	iii	What is first law of thermodynamics Explain it with the help of an example.	**3** **2**