iii. Write the first and second law of thermodynamics and explain briefly. Also write an application of each. **5**

OR iv. Write short note on: **5**
(a) Entropy
(b) Heat engine and its thermal efficiency.

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Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2019

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.

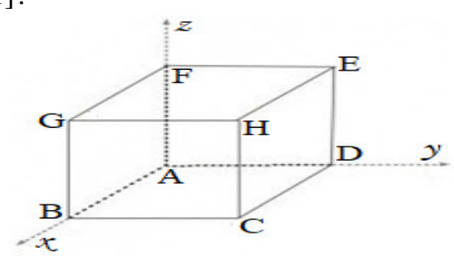
Q.1 i. The lower energy level contains more atoms than upper level under the conditions of ____ **1**
(a) Isothermal packaging (b) Population inversion
(c) Thermal equilibrium (d) Pumping

ii. In an optical fiber, the concept of Numerical aperture is applicable in describing the ability of_____ **1**
(a) Light Collection (b) Light Scattering
(c) Light Dispersion (d) Light Polarization

iii. The fringe width for Fresnel's Biprism experiment can be expressed as **1**
(a) $\beta=\lambda / D$ (b) $\beta =\lambda.D$ (c) $\beta= D\lambda / 2d$ (d) $\beta = \lambda \times 2d$

iv. Polaroid sunglasses decreases the glare on a sunny day because it **1**
(a) Completely absorb the light
(b) Refract the light
(c) Have a special colour
(d) Block a portion of light

v. If x, y, and z are three positive axes of the crystallographic coordinate system with origin at point A, **1** then which line points in the direction [1 0 1]? **1**



(a) AD (b) CH (c) FB (d) GE

P.T.O.

vi. The concept of matter wave was suggested by_____ **1**
(a) Heisenberg (b) de Broglie
(c) Schrodinger (d) Laplace

vii. What type of waves carry sound in air **1**
(a) Transverse wave (b) Longitudinal wave
(a) Electromagnetic wave (d) Transverse and Longitudinal wave

viii. At the mean position, the total energy in S.H.M. is **1**
(a) Purely potential (b) Purely kinetic
(c) Zero (d) None of these

ix. The cut-in voltage for Si diode is approximately **1**
(a) 0.2 V (b) 0.6 V (c) 1.1 V (d) None of these

x. The conduction of heat from hot body to a cold body is an example of **1**
(a) Reversible process
(b) Irreversible process
(c) Reversible and Irreversible process both
(d) None of these

Q.2 i. The refractive indices of core and cladding materials of a step index fibre are 1.48 and 1.45, respectively. Calculate: **2**
(a) Numerical aperture (b) Acceptance angle.

ii. Derive the relation between Einstein's A and B coefficients. **3**

iii. What do you understand by Step and Graded index fiber (GIF)? Explain briefly and give the reason for the absence of modal dispersion in GIF. **5**

OR iv. Describe the construction and working principal of a Nd:YAG laser with the help of a suitable energy level diagram. **5**

Q.3 i. In a Newton's ring experiment the diameter of the 4^{th} and 12^{th} dark rings are 0.400 cm and 0.700 cm, respectively. Determine the diameter of 20^{th} dark ring. **2**

ii. In a grating spectrum, which spectral line in 4^{th} order will overlap with 3^{rd} order line of 5891 A^0. **3**

iii. What do you understand by double refraction phenomenon? Write the name of two doubly refracting crystals. Also discuss the difference between positive and negative crystals with the help of suitable diagrams. **5**

OR iv. What is a plane transmission grating? Obtain the expression $(a + b) \sin\theta = n\lambda$. **5**

Q.4 i. Write the physical significance of wave function Ψ. **2**

ii. Prove that electron cannot be present inside the nucleus. **3**

iii. Particle which is moving in one-dimensional box described by the following boundary conditions; **5**
$V = 0$ for $0 < x < L$ and
$V = \infty$ for $0 \geq x$ and $x \geq L$
Write and solve its Schrodinger's wave equation and obtain Eigen value and Eigen function.

OR iv. What is meant by Atomic Packing Factor (APF)? Show that APF for face centered cubic (FCC) structure is 0.74. **5**

Q.5 i. The displacement equation of a particle describing simple harmonic motion is $x = 0.01 \sin 100\ \pi\ (t + 0.005)$ meter, where x is displacement of the particle at any instant t. Calculate the amplitude, periodic time, maximum velocity and displacement at the time of the motion. **2**

ii. What you meant by simple harmonic motion (SHM), explain? Also define few important characteristics of SHM such as **3**
(a) Acceleration (b) Frequency
(c) Phase.

iii. What do you understand by Damped oscillations, derive the relation between angular frequency, damping coefficient and natural frequency? Also discuss briefly about weak, heavy and critical damping. **5**

OR iv. Write the Maxwell equations in both differential and integral forms and provide the physical significance of each equation. **5**

Q.6 i. Calculate the conductivity of pure Silicon at room temperature when the concentration of carriers is 1.6×10^{10} per cm^3. (Given μ_e=1500 cm^2/volt-sec and μ_h=500 cm^2/volt-sec at room temperature). **2**

ii. What do you understand by depletion layer? Describe in detail with the help of suitable diagram and show how it changes in forward and reverse bias condition. **3**

Marking Scheme
EN3BS10 Physics for Computing Science

Q.1	i.	The lower energy level contains more atoms than upper level under the conditions of ____ (c) Thermal equilibrium	**1**
	ii.	In an optical fiber, the concept of Numerical aperture is applicable in describing the ability of_____ (a) Light Collection	**1**
	iii.	The fringe width for Fresnel's Biprism experiment can be expressed as (c) $\beta = D\lambda / 2d$	**1**
	iv.	Polaroid sunglasses decreases the glare on a sunny day because it (d) Block a portion of light	**1**
	v.	If x, y, and z are three positive axes of the crystallographic coordinat e system with origin at point A, **1** then which line points in the direction [1 0 1]? (c) FB	**1**
	vi.	The concept of matter wave was suggested by_____ (b) de Broglie	**1**
	vii.	What type of waves carry sound in air? (b) Longitudinal wave	**1**
	viii.	At the mean position, the total energy in S.H.M. is (a) Purely potential (b) Purely kinetic (c) Zero (d) None of these	**1**
	ix.	The cut-in voltage for Si diode is approximately (b) 0.6 V	**1**
	x.	The conduction of heat from hot body to a cold body is an example of (b) Irreversible process	**1**
Q.2	i.	Calculate: (a) Numerical aperture 1 mark (b) Acceptance angle 1 mark	**2**
	ii.	Derive the relation between Einstein's A and B coefficients. Expression till probability of stimulate absorption = probability o stimulate emission: 1 mark Expression till energy density of photons in equilibrium: 1 mark Expression till final expression of Einstein's A and B coefficients: 1 mark	**3**
	iii.	Definition of Step and Graded index fiber 2 marks Profile of Step and Graded index fiber 2 marks Reason for the absence of modal dispersion in GIF 1 mark.	**5**
OR	iv.	Construction of a Nd:YAG laser 2 marks Working principal of a Nd:YAG laser 2 marks Energy level diagram 1 mark	**5**
Q.3	i.	Determine the diameter of 20^{th} dark ring Formula 1 mark Result 1 mark	**2**
	ii.	In a grating spectrum, Formula 1 mark Rest calculation 2 marks	**3**
	iii.	Double refraction phenomenon 2 marks Two doubly refracting crystals 1 mark Positive and negative crystals with diagrams 2 marks	**5**
OR	iv.	Plane transmission grating 1 mark Derivation of expression $(a + b) \sin\theta = n\lambda$. 4 marks	**5**
Q.4	i.	Physical significance of wave function Ψ 1 mark for each (1 mark * 2)	**2**
	ii.	Prove that electron cannot be present inside the nucleus.	**3**
	iii.	Schrodinger's wave equation 1 mark Figure 1 mark Eigen value 2 marks Eigen function 1 mark	**5**
OR	iv.	Atomic Packing Factor (definition with formula) 2 marks Diagram of face centered cubic (FCC) structure 1 mark Atomic Packing Factor calculation 2 marks	**5**
Q.5	i.	Calculate the amplitude, periodic time, maximum velocity and displacement at the time of the motion. Stepwise marking	**2**
	ii.	Simple harmonic motion (SHM) 1.5 marks (a) Acceleration 0.5 mark (b) Frequency 0.5 mark (c) Phase. 0.5 mark	**3**
	iii.	Damped oscillations 1 mark Relation between angular frequency, damping coefficient and natural frequency 3 marks	**5**

		Weak, heavy and critical damping	1 mark	
OR	iv.	Maxwell equations in both differential and integral forms		**5**
			3 marks	
		Physical significance of each equation	2 marks	
Q.6	i.	Calculate the conductivity of pure Silicon at room temperature		**2**
	ii.	Depletion layer	1 mark	**3**
		Diagram and changes in forward and reverse bias condition		
			2 marks	
	iii.	First and second law of thermodynamics	3 marks	**5**
		Application of both laws	2 marks	
OR	iv.	Write short note on:		**5**
		(a) Entropy	2 marks	
		(b) Heat engine	1 mark	
		Its thermal efficiency.	2 marks	

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