Printed page: 02 **Subject Code: ACSBS0101**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY ,GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

BACHELOR OF TECHNOLOGY (B.Tech)

(SEM: Ist Theory Examination (2020-2021)

SUBJECT NAME: PHYSICS FOR COMPUTING SCIENCE

Time: 3 Hours **Max. Marks:100**

General Instructions:

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of 02 pages & 8questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- Section A -Question No- 1 is very short answer type carrying 1 mark each, Question No- 2 is short answer type carrying 2 mark each. You are expected to answer them as directed.
- Section B - Question No-3 is Long answer type -I questions with external choice carrying 6 marks each. You need to attempt any five out of seven questions given.
- Section C - Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 10 marks each. You need to attempt any one part *a* or *b.*
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A

1.	**Attempt all parts.**		**[10×1=10]**	**CO**
	a.	What is periodic motion?	**(1)**	**CO1**
	b.	Write continuity equation for current densities.	**(1)**	**CO1**
	c.	Why the centre of Newton's rings is dark?	**(1)**	**CO2**
	d.	What is polarized light?	**(1)**	**CO2**
	e.	Name any one application of uncertainty principle.	**(1)**	**CO3**
	f.	What are matter waves?	**(1)**	**CO3**
	g.	What is the value of packing factor for FCC crystal?	**(1)**	**CO4**
	h.	What are the current carriers in semiconductor?	**(1)**	**CO4**
	i.	Define meta-stable state.	**(1)**	**CO5**
	j.	What is the principle of optical fiber communication?	**(1)**	**CO5**
2.	**Attempt all parts.**		**[5×2=10]**	**CO**
	a.	Write Maxwell's equations in differential form.	**(2)**	**CO1**
	b.	Why Newton's rings are circular?	**(2)**	**CO2**
	c.	Calculate the de-Broglie wavelength of an electron which has been accelerated from rest through a potential difference of 100 volt.	**(2)**	**CO3**
	d.	What are Miller indices? How are they calculated?	**(2)**	**CO4**
	e.	Define first law of thermodynamics.	**(2)**	**CO5**

SECTION – B

3.	**Answer any <u>five</u> of the following-**		**[5×6=30]**	
	a.	Drive an expression for energy decay in damped harmonic oscillator.	**(6)**	**CO1**
	b.	Discus the principle of superposition and also derive an expression for resultant intensities.	**(6)**	**CO2**
	c.	Derive the Schrodinger time independent wave equations.	**(6)**	**CO3**
	d.	Calculate the conductivity of pure silicon at room temperature when the concentration of carrier is $1.5x10^{16}m^{-3}$ and the mobility of electrons and holes are 0.12 and 0.05 m^2/V-s respectively at room temperature.	**(6)**	**CO4**
	e.	Distinguish absorption, spontaneous emission and stimulated emission.	**(6)**	**CO5**
	f.	In p-type semiconductor, the Fermi level is 0.3 eV above the valence band at temperature 300 K. Find the position of new Fermi level at temperature 400 K.	**(6)**	**CO4**
	g.	Newton's rings are observed in reflected light of wavelength 5890 Å. The radius of the convex surface of the lens is 100 cm. A liquid is put between curved surface of lens and plate. The diameter of 10th ring is 4.2 mm. Calculate the refractive index of liquid when ring is dark.	**(6)**	**CO2**

SECTION – C

4	**Answer any <u>one</u> of the following-**		**[5×10=50]**	**CO**
	a.	Discuss the characteristics of simple harmonic motion.	**(10)**	**CO1**
	b.	Derive Maxwell's equation in non-conducting medium.	**(10)**	**CO1**
5.	**Answer any <u>one</u> of the following-**			
	a.	Explain the formation of Newton's ring. Prove that in reflected light the diameter of dark rings is proportional to the square root of natural numbers.	**(10)**	**CO2**
	b.	Discuss the phenomenon of Fraunhofer diffraction at single slit and find relative intensities of successive maxima.	**(10)**	**CO2**
6.	**Answer any <u>one</u> of the following-**			
	a.	An electron is bound in a one-dimensional potential box of width $2.5x10^{-10}$m. Assuming the height of the box to be infinite, calculate the lowest two permitted energy values of the electron.	**(10)**	**CO3**
	b.	A particle is in motion along a line x =0 and x= L with zero potential energy. At point for which x < 0 and x > L, the potential energy is infinite. Solving Schrodinger equation, obtain energy eigen values & normalized wave function for the particle.	**(10)**	**CO3**
7.	**Answer any <u>one</u> of the following-**			
	a.	Classify the solids on the basis of band theory?	**(10)**	**CO4**
	b.	Show that Fermi energy level in intrinsic semiconductor lies half way between the top of valence band and bottom of conduction band.	**(10)**	**CO4**
8.	**Answer any <u>one</u> of the following-**			
	a.	Describe the construction and working of Ruby Laser with neat diagram.	**(10)**	**CO5**
	b.	What are Einstein's A and B coefficient? Establish a relation between them.	**(10)**	**CO5**