Printed page:03 **Subject Code: AAS0101C**

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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: First Theory Examination (2020-2021)

SUBJECT NAME: ENGINEERING PHYSICS

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 03 pages & 8 questions.
- 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 questions 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 question 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.	**Answer all the parts-**		**[10×1=10]**	**CO**
	a.	What is massless particle?	**(1)**	**CO1**
	b.	Write Lorentz transformation equations of space and time.	**(1)**	**CO1**
	c.	What is Higgs Boson?	**(1)**	**CO2**
	d.	Write any one application of uncertainty principle.	**(1)**	**CO2**
	e.	What do you understand by coherent sources?	**(1)**	**CO3**
	f.	Name any two optical filters.	**(1)**	**CO3**
	g.	Define skin depth.	**(1)**	**CO4**
		OR		
		Define Photovoltaic effect.		
	h.	Write Maxwell's equation of Ampere's law.	**(1)**	**CO4**
		OR		
		Define Fermi Dirac distribution function.		
	i.	Name any two dielectric materials.	**(1)**	**CO5**
		OR		
		Write different types of magnetic and semiconductor memories.		
	j.	Define Ferro-electricity.	**(1)**	**CO5**
		OR		
		Define dispersion in optical fibres.		

2.	**Answer <u>all</u> the parts.**		**[5×2=10]**	**CO**
	a.	Write down the postulates of special theory of relativity.	**(2)**	**CO1**
	b.	Calculate the de-Broglie wavelength of an electron which has been accelerated from rest through a potential difference of 100 volt.	**(2)**	**CO2**
	c.	What do you mean by resolving power of a grating?	**(2)**	**CO3**
	d.	Explain the concept of displacement current.	**(2)**	**CO4**
		OR		
		Define drift velocity.		
	e.	Explain the concept of polarization of dielectric materials.	**(2)**	**CO5**
		OR		
		Explain the construction of optical fibre.		

<u>SECTION – B</u> **CO**

3.	**Answer any <u>five</u> of the following-**		**[5×6=30]**	
	a.	Derive the relativistic energy-momentum relationship in special theory of relativity.	**(6)**	**CO1**
	b.	Derive the Schrodinger time independent and time dependent wave equations.	**(6)**	**CO2**
	c.	Discuss the phenomenon of Fraunhofer diffraction at single slit and show that the relative intensities of successive maxima are nearly : $1:\frac{4}{9\pi^2}:\frac{4}{25\pi^2}:\frac{4}{49\pi^2}$	**(6)**	**CO3**
	d.	Write down the Maxwell's equations in differential and integral form and give physical significance of each (no derivation required).	**(6)**	**CO4**
		OR		
		Explain the construction and working of solar cell.		
	e.	Derive an expression for Claussius -Mossotti equation.	**(6)**	**CO5**
		OR		
		Stablish the relation between Einstein's coefficients of radiation transitions.		
	f.	A soap film of refractive index 1.43 is illuminated by white light incident at an angle of 30^0. The reflected light is examined by a spectroscope in which dark band corresponding to the wavelength 6000 Å is observed. Calculate the thickness of the film.	**(6)**	**CO3**
	g.	Consider a rod of length 2 cm inclined at an angle 60^0 along the direction of motion in a frame moving at speed 0.9c. What will be the length of rod as measured by an observer from rest frame?	**(6)**	**CO1**

<u>SECTION – C</u> **CO**

4	**Answer any <u>one</u> of the following-**		**[5×10=50]**	
	a.	Derive an expression for Einstein's mass energy relation. What does it signify physically?	**(10)**	**CO1**
	b.	An observer on a railway platform finds that a train moving with velocity 0.6c passes him in half a second. What is the length of the train measured by him and the proper length?	**(10)**	**CO1**

5. Answer any <u>one</u> of the following-

a. Show that $\psi(x, y, z, t) = \psi(x, y, z) e^{-iwt}$ is a wave function of a stationary state. **(10) CO2**

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) CO2**

6. Answer any <u>one</u> of the following-

a. 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. **(10) CO3**

b. Describe how Newton's rings experiment can be used to determine the refractive index of a liquid. **(10) CO3**

7. Answer any <u>one</u> of the following-

a. Deduce Coulomb's law of electro-statistics from Maxwell's first equation. **(10) CO4**

Or

Explain the concept of electrical conductivity in metals and derive the expression for electrical conductivity for n-type and p-type semiconductors.

b. What is Poynting vector? Derive and explain Poynting theorem. **(10) CO4**

OR

Derive an expression for the position of Fermi level in intrinsic and extrinsic semiconductors.

8. Answer any <u>one</u> of the following-

a. A metal sphere of radius a carries charge Q. It is surrounded by a linear dielectric material of permittivity ϵ and radius b. Find bounded surface and volume charge densities. **(10) CO5**

OR

Discuss the construction and operation of He-Ne laser. Why the discharge tube is made narrower in He-Ne laser?

b. What are different types of polarization? Explain. **(10) CO5**

OR

Differentiate between step index and graded index optical fiber. Derive the relation for acceptance angle in optical fiber.