

## Model Question Paper-II with effect from 2022-23 (CBCS Scheme)

USN

--	--	--	--	--	--	--	--	--	--

### First/Second Semester B.E. Degree Examination

### Subject Title APPLIED PHYSICS FOR EEE STREAM

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.  
 02. Draw neat sketches where ever necessary  
 03. **Constants** : Speed of Light ' $c$ ' =  $3 \times 10^8$  ms<sup>-1</sup>, Boltzmann Constant ' $k$ ' =  $1.38 \times 10^{-23}$  JK<sup>-1</sup>,  
 Planck's Constant ' $h$ ' =  $6.625 \times 10^{-34}$  Js , Acceleration due to gravity ' $g$ ' =  $9.8$  ms<sup>-2</sup>,  
 Permittivity of free space ' $\epsilon_0$ ' =  $8.854 \times 10^{-12}$  F m<sup>-1</sup>

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Obtain the expression for Eigen value and Eigen function for particle in a box.	L2	10
	b	What is wave function, Probability density and normalisation of wave function	L2	06
	c	An electron has a speed of $4.8 \times 10^5$ m/s accurate to 0.012%. With what accuracy can be located the position of electron.	L3	04
OR				
Q.02	a	Derive expression for deBroglie wavelength. Mention different forms for deBroglie wavelength.	L2	08
	b	State and explain Heisenberg Uncertainty principle and Principle of Complementarity.	L2	07
	c	A particle of mass 0.65 MeV/C <sup>2</sup> has kinetic energy 120eV. Find its deBroglie wavelength, where c is the velocity of light.	L3	05
Module-2				
Q. 03	a	What is superconductivity? Outline, qualitatively the BCS theory of superconductivity.	L2	08
	b	What is polarisation? Describe the different polarisation mechanism.	L2	08
	c	If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is $4.3 \times 10^{-8}$ C/m <sup>2</sup> . Calculate the dielectric constant of NaCl.	L3	04
OR				
Q.04	a	Discuss the solid, liquid and gaseous dielectrics with one example each. Explain the role of dielectrics as a electrical insulator.	L2	08
	b	What are SQUIDS? Explain briefly the working of SQUID.	L2	08
	c	At 6 K critical field is $5 \times 10^3$ A/m. Calculate the transition temperature when critical magnetic field is $2 \times 10^4$ A/m at 0 K.	L3	04
Module-3				
Q. 05	a	Explain the conditions and requisites for Laser action.	L2	07
	b	Define numerical aperture and fraction index change. Explain different types of optical fibers.	L2	08
	c	Find the core radius necessary for single mode operation at 850 nm with core and cladding refractive indices 1.49 and 1.48 respectively, also calculate the number of the modes present in the fiber.	L3	05

OR				
Q. 06	a	Discuss point to point optical fiber communication system. Mention two advantages and disadvantages of optical fiber system.	L2	09
	b	Discuss the working of laser printer	L2	07
	c	He-Ne laser is emitting a laser beam with an average power of 4.5mW. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is 632.8 nm	L3	04
Module-4				
Q. 07	a	Derive wave equation for electromagnetic waves in vacuum in terms of electric field using Maxwell's equation	L2	09
	b	Explain the terms gradient of a scalar, divergence and curl of a vector. Derive Gauss divergence theorem	L2	07
	c	Find the divergence of the vector field $\vec{A}$ given by $\vec{A} = 6x^2\vec{a}_x + 3xy^2\vec{a}_y + xyz^3\vec{a}_z$	L3	04
OR				
Q. 08	a	Discuss continuity equation? Derive the expression for displacement current.	L2	09
	b	Explain the transverse nature of electromagnetic waves.	L2	07
	c	Calculate the curl of $\vec{A}$ given by $\vec{A} = (1 + yz^2)\vec{a}_x + xy^2\vec{a}_y + x^2y\vec{a}_z$	L3	04
Module-5				
Q. 09	a	Establish relation between Fermi energy and energy gap for an intrinsic semiconductor. Discuss the law of mass action	L2	09
	b	What is Hall voltage & Hall field? Obtain expression for Hall voltage in terms of Hall Coefficient	L2	06
	c	An n- type Germanium sample as a Donor density of $10^{21}/\text{m}^3$ . it is arranged in a Hall experiment having magnetic field of 0.5 T and the current density is $500 \text{ A}/\text{m}^2$ . Find the Hall voltage if the sample is 3 mm wide.	L3	05
OR				
Q. 10	a	Describe the construction and working of semiconductor laser with energy level diagram.	L2	08
	b	Explain the construction and working of photo transistor and also mention any two applications.	L2	08
	c	The following data are given for intrinsic germanium at 300 K, $n_i=2.4 \times 10^{19}/\text{m}^3$ , $\mu_e=0.39 \text{ m}^2\text{v}^{-1} \text{ s}^{-1}$ , $\mu_h=0.19 \text{ m}^2\text{v}^{-1} \text{ s}^{-1}$ . Calculate the resistivity of the sample.	L3	04

\*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.

Table showing the Bloom's Taxonomy Level, Course Outcome and Program Outcome				
Question		Bloom's Taxonomy Level attached	Course Outcome	Program Outcome
Q.1	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.2	(a)	L2	1	1,2
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.3	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.4	(a)	L2	1	1,2
	(b)	L2	1	1,2
	(c)	L3	1	1,2
Q.5	(a)	L2	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L3	2	1,2
Q.6	(a)	L2	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L3	2	1,2
Q.7	(a)	L2	3	1,2,12
	(b)	L2	3	1,2,12
	(c)	L3	3	1,2
Q.8	(a)	L2	3	1,2
	(b)	L2	3	1,2,12
	(c)	L3	3	1,2
Q.9	(a)	L3	4	1,2,12
	(b)	L2	4	1,2,12
	(c)	L3	4	1,2
Q.10	(a)	L2	4	1,2,12
	(b)	L2	4	1,2,12
	(c)	L3	4	1,2