PAPER ID-421046

Subject Code: KAS201

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM II) THEORY EXAMINATION 2021-22
PHYSICS

Time: 3 Hours ***Total Marks: 100***

Notes:

- *Attempt all Sections and Assume any missing data.*
- *Appropriate marks are allotted to each question, answer accordingly.*

SECTION-A	Attempt **All** of the following Questions in brief	Marks**(10X2=20)**	**CO**
Q1(a)	State Einstein's postulates of special theory of relativity.		1
Q1(b)	Show that the rest mass of a photon is zero.		1
Q1(c)	State equation of continuity.		2
Q1(d)	Define skin depth.		2
Q1(e)	What is black body radiation?		3
Q1(f)	What is wave-particle duality?		3
Q1(g)	What are coherent sources?		4
Q1(h)	Differentiate Fresnel's and Fraunhofer's diffraction.		4
Q1(i)	What do you mean by attenuation and dispersion in optical fiber?		5
Q1(j)	What are the main components of laser?		5

SECTION-B	Attempt **ANY Three** of the following Questions	Marks**(3X10=30)**	**CO**
Q2(a)	What is length contraction? Derive the necessary expression for it. Show that $x^2+y^2+z^2- c^2t^2$ is invariant under Lorentz transformation.		1
Q2(b)	What is displacement current? For a medium, conductivity $\sigma = 58 \times 10^6$ seimen/m, $\in_r = 1$. Find out the conduction and displacement current densities if the magnitude of electric field intensity is given by $E = 150 \sin (10^{10} t)$ Volt/m.		2
Q2(c)	What is de-Broglie hypothesis? Find the least energy of an electron moving in one dimension in an infinitely high potential box of width 1×10^{-10}m. (Mass of electron is 9.1×10^{-31} kg and $h = 6.63\times10^{-34}$J-s)		3
Q2(d)	Explain interference in thin films and prove that reflection and transmission are complementary with each other.		4
Q2(e)	Derive the expressions for acceptance angle and numerical aperture of an optical fiber.		5

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q3(a)	By using Lorentz transformation equations, derive time dilation. Show that time dilation is a real effect.		1
Q3(b)	Discuss and derive the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate. Show that $E^2 - P^2C^2 = m_0^2c^4$, Where P is the momentum.		1

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q4(a)	Derive electromagnetic wave equation in free space and prove that electromagnetic waves travel with speed of light in free space.		2
Q4(b)	Derive the Poynting or work-energy theorem for the flow of energy in an electromagnetic field. Also give the physical interpretation		2

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q5(a)	Give the physical significance of wave function. Derive Schrodinger's time independent wave equation.		3
Q5(b)	Define Compton effect and derive an expression for the Compton shift (Δλ).		3

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q6(a)	Explain and describe the formation of Newton's rings in reflected light. Prove that in reflected the diameters of dark rings are proportional to the square roots of natural numbers.		4
Q6(b)	Discuss single slit Fraunhofer's diffraction and show that the relative intensities of successive maximum are nearly 1: 1/22 : 1/62 : 1/121:....		4

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q7(a)	With the help of diagram classify and describe various types of optical fibers based on modes and core refractive index.		5
Q7(b)	Draw a neat diagram of He-Ne laser and explain the construction and working of it.		5

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