**Printed Pages:02** **Sub Code: KAS201**

**Paper Id:** 199240 **Roll No.** | | | | | | | | | | |

**B. TECH.**

**(SEM-II) THEORY EXAMINATION 2018-19**

**PHYSICS**

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

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

**1. Attempt *all* questions in brief. 2 x 10 = 20**

a. Explain the negative results of Michelson-Morley experiments.
b. What is length contraction?
c. Define inertial and non-inertial frames.
d. What are massless particles?
e. What is displacement current?
f. What is Poynting theorem?
g. Write the assumptions of Planck's hypothesis
h. Explain the necessity of extended sources.
i. What are the Newton's rings?
j. Define dispersive power of grating.

## SECTION B

**2. Attempt any *three* of the following: 10x3=30**

a. Drive an expression for time dilation. A clock measures the proper time. With what speed it should move relative to an observer so that it appears to go slow by 30s in 24 hours.
b. Discuss the phenomenon of interference of light due to thin films and find the conditions of maxima and minima. Show that the interference patterns of reflected and transmitted monochromatic light are complementary.
c. What do you understand by 3 and 4 levels LASER? What are the advantages of 3 level over 4 level LASER?
d. What do you understand by an optical fiber and discuss its classification.Calculate the numerical aperture, acceptance angle and the critical angle of the fiber from the following data: $\mu_1$ (core refractive index) = 1.50 and $\mu_2$ (cladding refractive index) =1.45.
e. Derive a suitable expression for continuity equation. Give its physical significance. A 100 watt sodium lamp radiating its power. Calculate the electric field and magnetic field strength at a distance of 5m from the lamp.

## SECTION C

**3. Attempt any *one* part of the following: 5x2=10**

a. Deduce Einstein's mass-energy relation $E = mc^2$. Give some evidence showing its validity.A particle of rest mass $m_0$moves with speed $\frac{c}{\sqrt{2}}$. Calculate its mass, momentum, total energy and kinetic energy.
b. Discuss the phenomenon of Fraunhofer's diffraction at a single slit and show that the relative intensities of the successive maximum are nearly **1:** $\frac{4}{9\pi^2}$ **:** $\frac{4}{25\pi^2}$ **:** $\frac{4}{49\pi^2}$**:** **…….**

**4. Attempt any *one* part of the following: 5x2=10**

a. Prove that electromagnetic waves are transverse in nature.For a conducting medium, $\sigma$ = 5.8 x $10^6$ Siemens/m and $\varepsilon_r$ = **1**. Find out the conduction and displacement current densities if the magnitude of electric field intensity E is given by E=150 sin ($10^{10}$ t) Volt/m.

b. Explain the construction and working of Ruby laser.In a Ruby laser, total of $Cr^{3+}$ ions is $2.8\times10^{19}$. If the laser emits radiation of wavelength 7000Å. Calculate energy of the laser pulse.

**5. Attempt any *one* part of the following: 5x2=10**

a. Derive Planck's law of radiation. How does it explain Wien's displacement and Rayleigh-Jeans laws?Calculate the energy of an oscillator of frequency $4.2\times10^{12}$ Hz at 27°C treating it as (a) classical oscillator (b) Planck's oscillator.

b. Deduce four Maxwell's equations in free space. Show how the concept of Maxwell's displacement current leads to the modification of Ampere's law.

**6. Attempt any *one* part of the following: 5x2=10**

a. Derive a suitable expression for Momentum and radiated pressure of an EM wave.

b. What is Compton effect? Derive a suitable expression for Compton Shift $(\lambda'-\lambda = \frac{h}{m_o c}(1-\cos\phi))$. X-rays of wavelength 2Å are scattered from a black body and X rays are scattered at an angle 45°. Calculate Compton shift ($\Delta\lambda$), wavelength of the scattered Photons $(\lambda')$.

**7. Attempt any *one* part of the following: 5x2=10**

a. Derive time-dependent and time-independent Schrodinger's wave equation.

b. What do you understand by grating? Explain its spectra. What particular spectra would be absent if the width of the transparencies and opacities of the grating are equal.Find the angular separation of 5048 Å and 5016Å wavelength in second order spectrum obtained by a plane diffraction grating having 15000 lines per inch.