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**BTECH**  
**(SEM I) THEORY EXAMINATION 2023-24**  
**ENGINEERING PHYSICS**

TIME: 3HRS

M.MARKS: 100

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

**SECTION A**

1. Attempt all questions in brief.

Qno.	Question	Marks
a.	Is earth an inertial frame or non-inertial frame of reference? Explain it	2
b.	What was the objective of conducting the Michelson-Morley experiment?	2
c.	Define skin depth for good conductors.	2
d.	Write formula for radiation pressure exerted by electromagnetic waves.	2
e.	Deduce an expression for the wavelength of matter waves	2
f.	What is the physical significance of wave function?	2
g.	Why Newton's rings are circular?	2
h.	State Rayleigh criterion of Resolution.	2
i.	Differentiate between spontaneous and stimulated emission.	2
j.	With the help of a well-labelled diagram, name the components of an optical fibre.	2

**SECTION B**

2. Attempt any three of the following:

a.	Calculate the amount of work to be done to increase the speed of an electron from 0.6c to 0.8c. Given that the rest mass energy of electron= 0.5 MeV.	10
b.	Derive Maxwell's equations. Explain the physical significance of each equation	10
c.	Derive Schrodinger time independent wave equation. What happen if the particle is free?	10
d.	Light of wavelength 5500 Å falls normally on a slit of width $22.0 \times 10^{-5}$ cm. Calculate the angular position of first two minima on either side of central maximum.	10
e.	What are Einstein's coefficients A and B? Establish a relation between them.	10

**SECTION C**

3. Attempt any one part of the following:

a.	Deduce an expression for the time dilation based on Lorentz transformation equations. Give an example to show that time dilation is real effect.	10
b.	Deduce an expression for the variation of mass with velocity. Show that no particle can attain a velocity larger than the velocity of light.	10

4. Attempt any one part of the following:

a.	What is Poynting vector? Discuss the work-energy theorem for the flow of energy in an electromagnetic field.	10
b.	Derive the necessary expression for energy and momentum carried by an electro-magnetic wave.	10

5. Attempt any one part of the following:

a.	Solve the Schrodinger equation for one-dimensional motion of a particle in a box of side L and show that its eigen value is inversely proportional to the square of side L. Also find the expression for normalized wave function.	10
b.	What is Compton effect? Deduce an expression for Compton shift.	10

6. Attempt any one part of the following:

a.	What are Newton's rings? Why the center of Newton's rings appears dark? Derive the expressions for the diameter of nth dark as well as bright ring.	10
b.	Discuss the phenomena of Fraunhofer diffraction at a single slit and show that the relative intensities of the successive maximum are nearly $1: 4/9\pi^2 : 4/25\pi^2 : 4/49\pi^2 : \dots$	10

7. Attempt any one part of the following:

a.	Explain basic principle of optical fiber. Discuss fiber classification	10
b.	Describe the construction and working of the He-Ne laser. Write some important applications of laser.	10