PAPER ID-411350

Roll No:

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGINEERING PHYSICS-I

Time: 3 Hours   *Total Marks: 100*

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

SECTION A

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

a.	Differentiate the inertial and non-inertial frames of reference.
b.	What was the objective of conducting the Michelson-Morley experiment?
c.	State Heisenberg's Uncertainty principle.
d.	What was the main conclusion of Division –Germer experiment?
e.	Explain why a thick film shows no color in reflected white light.
f.	How a circular polarized light can be changed into plane polarized light?
g.	What is dispersive power of plane transmission grating?
h.	Why model dispersion is negligible in single mode fiber.
i.	What is the main component for laser action?
j.	Differentiate between photography and Holography?

SECTION B

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

a.	Write Lorentz transformation equations. Show that space time interval between two events remain invariant under Lorentz transformation equations.
b.	Find the probability of finding a particle trapped in a box of length L in the region from 0.45L to 0.55L for the ground state and the first excited state.
c.	A parallel beam of sodium light (λ =5890Å) strikes a film of oil floating on water. When viewed at an angle of 30° from the normal, 8th dark band is seen. Determine the thickness of the film. (Refractive index of oil=1.5)
d.	A plane transmission grating has 16,000 lines to an inch over a length of 5 inches. Find in the wavelength region of 6000 A^0, in the second order (i) the resolving power of grating and (ii) the small wavelength difference that can be resolved.
e.	What is population inversion? In a Ruby laser, total number of $Cr+3$ions is 2.8×10^{19}. If the laser emits radiation of wavelength 7000 Å Calculate the energy of laser pulse.

SECTION C

3.   Attempt any *one* part of the following: 10x1=10

a.	Discuss briefly Michelson- Morley experiment and mention its outcome.
b.	Deduce an expression for variation of mass with velocity. Also prove that no material particle can have a velocity equal or greater than velocity of light.

4.   Attempt any *one* part of the following: 10x1=10

a.	Find the expression for energy state of a particle in one dimensional box and solved it to find the Eigen value and Eigen function.
b.	Give physical significance of wave function. Derive time dependent Schrodinger equation.

5.   Attempt any *one* part of the following: 10x1=10

a.	Discuss the phenomenon of interference of light due to thin films and find the condition of maxima and minima. Show that the interference patterns of reflected and transmitted monochromatic source of light is complementary.

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b.	Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the relative intensities of successive maximum are nearly $1:4/9\pi^2:4/25\pi^2:4/49\pi^2$.

6.   Attempt any *one* part of the following: 10x1=10

a.	Analyses and describe the process of spontaneous and stimulated emission of radiation with the help of diagram. Obtain an expression for Einstein's coefficients of spontaneous and stimulated emission of radiation.
b.	Describe the construction and working of Nicol prism.

7.   Attempt any *one* part of the following: 10x1=10

a.	Explain the basic principle of optical fiber. Discuss fiber classification.
b.	What is holography? Discuss the construction of image on a hologram.