Roll No:

B.TECH
(SEM I) THEORY EXAMINATION 2020-21
PHYSICS

Time: 3 Hours   *Total Marks: 70*

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

SECTION A

1.   **Attempt *all* questions in brief.**   2 x 7 = 14

a.	Define inertial and non-inertial frame of reference with example.
b.	Define proper and improper time interval.
c.	Write down Maxwell's equation for free space.
d.	Why Newton's rings are circular?
e.	What do you mean by dispersive power of grating?
f.	Define population inversion and pumping.
g.	Define acceptance angle and numerical aperture.

SECTION B

2.   **Attempt any *three* of the following:**   7 x 3 = 21

a.	What was the objective of conducting the Michelson-Morley experiment? Describe the experiment. How is the negative result of the experiment interpreted?
b.	Describe and explain the formation of Newton's rings in reflected in monochromatic light. In Newton's experiment the diameter of 4th and 12th dark rings are 0.400 cm and 0.700 cm respectively, deduce the diameter of 20th dark ring.
c.	Discuss the phenomenon of interference of light in thin films and find the condition of maxima and minima. Show that the interference patterns of reflected and transmitted monochromatic source of light are complementary.
d.	Derive an expression for the intensity distribution due to Fraunhofer's diffraction by single slit. Show that the intensity of the first subsidiary maximum is about 4.5% of that of the principal maximum,
e.	Describe the construction and working of Nicol Prism. Explain how Nicol prism acts as a polarizer and analyzer.

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SECTION C

3. **Attempt any *one* part of the following:** 7 x 1 = 7

(a)	Calculate the amount of work to be done to increase the speed of a electron from $0.8c$ to $0.9c$. Given the rest energy of electron =0.5MeV where c is the velocity of light.
(b)	Deduce Einstein's mass energy relation. If the kinetic energy of a body is twice its rest mass energy, find its velocity.

4. **Attempt any *one* part of the following:** 7 x 1 = 7

(a)	Explain how wavelength of sodium light can be calculated from Fresnel biprisim experiment.
(b)	Assuming that all the energy from a 1000 watt lamp is radiated uniformly; calculate the values of the intensities of electric and magnetic fields of radiation at a distance of 2m from the lamp.

5. **Attempt any *one* part of the following:** 7 x 1 = 7

(a)	What are Einstein's coefficients? Derive Einstein's relation.
(b)	A diffraction grating used at normal incidence gives a green line (5400Å) in a certain order n superimposed on the violet line (4050 Å) of the next higher order. If the angle of diffraction is 30^0. Calculate the value of n. Also find how many lines per cm are there in the grating?

6. **Attempt any *one* part of the following:** 7 x 1 = 7

(a)	Describe the construction and working of Ruby laser with applications.
(b)	Explain why two level laser systems does not have any physical significance? Describe the principle and working of three-level and four-level laser systems.

7. **Attempt any *one* part of the following:** 7 x 1 = 7

(a)	Describe various types of optical fibers based on modes, material and refractive index profile.
(b)	What is meant by holography? Describe the construction and reconstruction of a hologram.