PAPER ID-311171

Roll No:

B- TECH
(SEM I) THEORY EXAMINATION 2020-21
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**

Qno.	Question	Marks	CO
a.	What are inertial and non-inertial frames of reference? Is an earth is inertial or non-inertial frame?	2	1
b.	If one photon has a speed c in one reference frame, can it be at rest in some other frame of reference explain?	2	1
c.	Give the physical signifance of equation of continuity.	2	2
d.	Calculate radiation pressure exerted by electromagnetic waves.	2	2
e.	Explain Black body radiation spectrum graph on the basis of quantum physics.	2	3
f.	Explain why a thick film shows no color in reflected white light.	2	4
g.	Differentiate between Ψ and $|\Psi|^2$	2	3
h.	What is dispersive power of plane transmission grating?	2	4
i.	Why population inversion is necessary for laser action?	2	5
j.	What do you mean by dispersion in optical fiber?	2	5

SECTION B

2. **Attempt any *three* of the following:**

Qno.	Question	Marks	CO
a.	A man leaves the earth in a rocket ship that makes a round trip to the nearest star which is 4 light years away at speed of 0.8c. How much younger will he be on his return that is twin brother who preferred to stay behind	10	1
b.	A 100 watt sodium lamp radiating its power. Calculate the electric field and magnetic field strength at a distance of 5 m from the lamp.	10	2
c.	Show that the de-Broglie wavelength for a material particle of rest mass m_0 and charge q accelerated from rest through a potential difference V, relativistically is given by: $$\lambda = \frac{h}{\sqrt{2m_0 qv\left(1 + \frac{qv}{2m_0 c^2}\right)}}$$	10	3
d.	Interference fringes are produced by a monochromatic light falling normally on a wedge shaped film whose refractive index is 1.4. The angle of the wedge is 20 second of an arc and the distance between the successive fringes is 0.25cm. Calculate the wavelength of light used.	10	4
e.	A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.0005. Find: (a) The cladding index. (b)The critical internal reflection angle (c) The numerical aperture.	10	5

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SECTION C

3. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Describe Michelson Morley experiment and explain physical signifance of its negative results.	10	1
b.	Show that the mass of a body depends on its velocity. Deduce an expression for the Variation of mass with velocity.	10	1

4. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Derive the Maxwell equations in differential form and integral form with physical signifance.	10	2
b.	What is poynting vector? How is the poynting theorem derived from Maxwell equations?	10	2

5. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	What are the conditions and limitations, a wave function must obey? Derive time independent Schrodinger equations.	10	3
b.	Discuss Compton effect and derive an expression for Compton shift with the help of suitable diagram	10	3

6. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
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 are complementary	10	4
b.	Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the relative intensities of successive maximum are nearly $1:4/9\pi^2:4/25\pi^2:4/49\pi^2$.	10	4

7. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Analyse 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	10	5
b.	Draw a neat diagram of He-Ne laser and describe its method of working? How is it superior to a Ruby laser?	10	5