B. TECH
(SEM-I) THEORY EXAMINATION 2019-20
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.   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.   Define poynting vector and write down its dimension.
    e.   Why Newton's rings are circular?
    f.   What do you mean by dispersive power of grating?
    g.   State two difference between interference and diffraction.
    h.   Define optical activity.
    i.   Define population inversion and pumping.
    j.   Define acceptance angle and numerical aperture.

SECTION B

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

    a.   What was the objective of conducting the Michelson-Morley experiment? Describe the experiment. How is the negative result of the experiment interpreted?
    b.   State and Deduce Poynting theorem for the flow of energy in an electromagnetic field.
    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.

SECTION C

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

    a.   Derive an expression for variation of mass with velocity.
    b.   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.

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

    a.   Write down Maxwell's equations in free space and show that E, H and direction of propagation from a set of orthogonal vectors.
    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:**   **10x1=10**

   a.   Describe experimental arrangement of Newton's ring and explain their formation.

   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:**   **10x1=10**

   a.   What is meant by plane polarized, circularly polarized and elliptically polarized light? Show that the plane polarized light and circularly polarized light are the special cases of elliptically polarized light.

   b.   Describe the construction and working of Ruby laser with applications.

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

   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.