SASTRA
DEEMED TO BE UNIVERSITY

School of .....SEEE.....

Third CIA Test – Jan 2023

Class : 1st B.Tech - CSBS

Course Code: PHY 137

Course Name: **FUNDAMENTALS OF PHYSICS**

Duration: 90 minutes Max Marks: 50

Instructions to the candidates:

Draw neat diagrams wherever necessary. Figures to the right indicate full marks.

PART A

Answer ANY FOUR questions: **(4 x 10 =40)**

1. With the help of half wave plate, quarter wave plate and analyser, construct the optical system to obtain unpolarised light to circularly polarized light, then circularly polarized light to linear polarized light, then rotate the linearly polarized light by 90 degrees. Then reduce their intensity to one by fourth.

2. The magnetic field of a plane electromagnetic wave is:
$\vec{B} = 10^{-9}\cos\left((\pi m^{-1})y + (3\pi \times 10^{8}\, sec^{-1})t\right)\hat{\imath}$ Tesla

   (a) In what direction does the wave travel?
   (b) What is the wavelength, frequency & speed of the wave?
   (c) What is the complete vector expression for E

3. A. standing waves are produced by the superposition of two waves,
$$y_1 = 7\sin 2\pi\left(\frac{t}{T} - \frac{2x}{\pi}\right) \text{ and } y_2 = 7\sin 2\pi\left(\frac{t}{T} + \frac{2x}{\pi}\right)$$
travelling in opposite directions. Find (a) the amplitude (b) the wavelength and (c) the velocity of the waves

4. Describe the working principle of CO_2 laser. Also explain advantages, disadvantages and applications

5. Define crystal. Explain the types of crystals with lattice parameters and also Baravias lattices with clear diagram

6. Explain working principle of refrigerator and discuss coefficient of performance

PART B

Answer ALL the questions: **(1 x 10 =10)**

7. (A) Express Ampere's circuital and Faraday laws and convert them from integral form to differential form. (5)

   (B) For a light source at mean wavelength 11500 A°, the coherence time 2.7×10^{-8} sec., calculate the (i) coherence length (ii) spectral width (iii) purity factor. (5)