

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

B.Tech. DEGREE – I SEMESTER

Electronics and Communication Engineering - B Section

Cycle Test -1

PHYSICS - I (PHIR 11)

Answer all Questions

Date: 12.10.2023

Duration: 1 hr.

Total Marks: 20

1. Explain the construction, population inversion of He-Ne laser and discuss its working principle with the help of energy level diagram. 5
2. 2 What is hologram? Explain how laser can be used to construct a hologram. 3
In a three-level laser system, the active medium has its metastable state located at 1.79 eV from which the stimulated emission is produced. Calculate the wavelength of light. At room temperature (300°C) when population inversion is not achieved, calculate the ratio of population between the metastable state and ground state. 2
3. Explain the principle, construction of optical fiber and explain when and how light travels through it. 5
4. 3 Derive an expression for the numerical aperture of an optical fiber using Snells law. Also arrive at an expression for fractional index difference. 3
5. The refractive indices of core and cladding of a fiber are 1.465 and 1.460, respectively, and light of wavelength 1550 nm is used. What would be the diameter of core for single mode propagation? If the core diameter is given as 50 μm , how many modes can propagate through this fiber? 2