

**B.Sc. PHYSICS
FOURTH SEMESTER
APPLIED OPTICS
BSP – 406**

**SET
A**

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs.

Full Marks: 35

[Objective]

Time: 15 mins.

Marks: 10

$1 \times 10 = 10$

Choose the correct answer from the following:

- Which property does laser not acquire?
 - Collimation
 - Monochrome
 - Coherence
 - Divergence
- Which of the following is not a candidate material for laser source in fiber optics?
 - Nd-YaG
 - Phosphorous
 - He-Ne
 - Argon
- The range of frequencies that a laser can produce is---?
 - 500 Hz - 30 kHz
 - 50 Hz - 50 kHz
 - 30 Hz - 500 kHz
 - 30 Hz - 30 kHz
- The technique by which image is obtained from a hologram is known as---?
 - Formation
 - Refraction
 - Projection
 - Reconstruction
- Power transmission in a hologram is given by--?
 - $T \cong 1 - \frac{\alpha l}{4}$
 - $T \cong 1 - \frac{\alpha l}{2}$
 - $T \cong 1 - \frac{\alpha l^2}{2}$
 - $T \cong 1 + \frac{\alpha l}{2}$
- Which of the following is incorrect?
 - The hologram does not contain a distinct image of the object.
 - The interference fringes are a series of zone-plate like rings.
 - The hologram carries a record of both the intensity and the relative phase of the light waves at each point.
 - In the recording of the hologram, the incident beam of light is scattered from the center of the object and acts as the source of spherical waves.
- Holographic optical elements are what kind of devices?
 - Refractive
 - Diffraction
 - Reflective
 - None of the above
- Numerical aperture of optical fiber is given by--?
 - $\mu_1 \sqrt{2 \Delta}$
 - $\mu_2 \sqrt{2 \Delta}$
 - $(\mu_1 - \mu_2) \sqrt{2 \Delta}$
 - $(\mu_1 + \mu_2) \sqrt{2 \Delta}$

9. Splicing losses in an optical fiber can range from--?
- | | | |
|------------------|----|-----------------|
| a. 0.1–0.5 dB/km | b. | 0.1 – 0.9 dB/km |
| c. 0.6–10 dB/km | d. | 0.5 – 10 dB/km |
10. The core diameter of a multimode fiber (MMF) is ---?
- | | |
|--------------------|----------------------|
| a. Larger than SMF | b. Smaller than SMF |
| c. Equal to SMF | d. None of the above |

(Descriptive)

Time : 1 hr. 15 mins.

Marks : 25

[Answer question no.1 & any two (2) from the rest]

1. What do you mean by the threshold condition of laser? Derive its formula. 1+4=5

2. Explain the theory of hologram in terms of total electric field. 10

3. a. Explain with diagram the theory of optical fiber. 4+6=10
b. Derive the critical angle of propagation, acceptance angle, acceptance cone and numerical aperture of an optical fiber.

4. Explain with proper diagram the theory and working principle of He-Ne laser. Mention its advantages. 9+1=10

5. Describe the mechanisms of attenuation in optical fiber. 10

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