2024
Skill Enhancement Course
APPLIED OPTICS
Paper Code : SEC0311403
Time : 1 Hour 30 Minutes
Full Marks : 30

(The figures in the margin indicate the full marks for the questions)

1. Choose the correct option of the following questions :   1×5=5

   a) The main principle of optical fiber is—

      i) total internal reflection

      ii) total internal refraction

      iii) total internal dispersion

      iv) none of the above

   b) Which one of the following lasers has the highest efficiency—
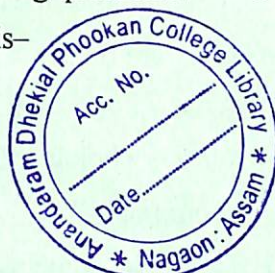
      i) Ruby   ii) Semiconductor

      iii) He-Ne   iv) Carbon dioxide

   c) The life time of an electron in metastable state is of the order of—

      i) 10^{-9}s   ii) 10^{-3}s   iii) 10^{-8}s   iv) 10^{-7}s

   d) The He-Ne laser is a kind of neutral atom gas laser in which the wave length of the laser is—

      i) 6328A°   ii) 6943A°

      iii) 6600A°   iv) None of the above

e) Which process gives the laser its special properties as an optical source–

i) Dispersion ii) Stimulated absorption
iii) Spontaneous emission iv) Stimulated emission

2. Answer *any five* of the following questions : 2×5=10

a) Why is the core's refractive index greater than the optical fibre cladding?

b) What is the meaning of the term LASER? Give some applications of the laser.

c) What are the basic components of a laser?

d) What is population inversion?

e) What is a hologram? How does it differ from ordinary photography?

f) Define the numerical aperture of a step-index fibre.

g) What are the characteristics of a laser beam?

3. Answer *any three* of the following questions : 5×3=15

a) Explain with a neat diagram, the process of absorption of light, spontaneous emission and stimulated emission of radiation.

b) Draw a neat diagram of helium-neon laser and describe its working principle.

c) Describe in short the construction and reconstruction of a hologram.

d) Discuss the basic principle of the Michelson interferometer.

e) Derive the expression for Einsteins coefficient

$$\frac{A_{21}}{B_{21}} = \frac{8\pi h v^3}{C^3}$$

where the symbols represent their usual meaning.

f) How can we classify optical fibres? Draw the block diagram of the optical communication system.

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