K24P 0324

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (C.B.S.S. – Reg./Supple.-(One Time Mercy Chance)/Imp.) Examination, April 2024
(2014 Admission Onwards)
PHYSICS
PHY 4C14 : Optics

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **both** the questions. (Either **a or b**).

1. a) i) Differentiate the principles of intrinsic and doped semiconductor lasers.
   ii) Obtain the theoretical condition for lasing action in semiconductor lasers.

   OR

   b) Describe the electro-optic effects. Explain how are they utilized for the enhancement of power of lasers.

2. a) Describe the nonlinear optical processes in crystals. Explain the physical processes of SHG, SFG, DFG and OR.

   OR

   b) Detail the possible signal distortions in optical wave guides. **(2×12=24)**

SECTION – B

Answer **any four** questions. (**One** mark for Part **a**, **3** marks for Part **b**, **5** marks for Part **c**)

3. a) What is quantum coherence correlation function ?
   b) What is the role of He in He-Ne laser ?
   c) Prove that a two-level system is not suitable for optical pumping.

4. a) Briefly explain semi-classical theory of lasers.
   b) What is the acceptance angle and numerical aperture for a fiber with refractive indices $n_1 = 1.48$ and $n_2 = 1.45$?
   c) Describe the Q-factor of resonance cavities of lasers.

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5. a) What is Faraday's magneto-optic effect ?
   b) Explain the tensor properties of optical susceptibility.
   c) How does sum frequency generation occur in nonlinear materials ?

6. a) Write a note on the variation of refractive index with intensity of light.
   b) How are second harmonics generated in nonlinear media ?
   c) Explain the basis of intensity dependence on the refractive index of materials.

7. a) What is Coherent Antistokes Raman Scattering ?
   b) Explain the principle of Stimulated Raman Gain Spectroscopy.
   c) What are Type I and Type II phase matching ?

8. a) Explain the pulse broadening in optical fibers.
   b) Deduce the acceptance angle and numerical aperture of an optical fiber.
   c) What is the basis of optical fiber amplifiers ? **(4×9=36)**

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