K23U 0239

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Supplementary) Examination, April 2023
(2017 to 2018 Admissions)
CORE COURSE IN PHYSICS
6B12PHY : Photonics and Spectroscopy

Time : 3 Hours

Max. Marks : 40

SECTION – A

(Answer **all** the questions. Very short answer type. **Each** question carries **1** mark.)

1. The rotational spectroscopy is in the region of _____
2. LASER is an acronym of _____
3. In a diatomic vibrating rotator, spectral line corresponds to $\Delta J = \mp 1$ corresponds to _____
4. The construction of hologram made use of the principle of _____ **(4×1=4)**

SECTION – B

(Answer **any 7** questions. Short answer type. **Each** question carries **2** marks.)

5. Mention any four applications of optical fiber.
6. A homo nuclear diatomic molecule does not respond to microwave radiation, why ?
7. Explain stimulated emission.
8. Why oxygen molecules do not show IR absorption or emission ?
9. How will you classify the notation of a three-dimensional molecule based on the relative values of principal moment of inertia ?
10. Briefly explain acceptance angle and critical angle.

P.T.O.

K23U 0239

11. What are the salient features of vibrational-rotational spectra ?
12. What are the essential components of a laser ? Explain their functions.
13. What is the purpose of cladding an optical fiber ?
14. Briefly explain how hologram is constructed. **(7×2=14)**

SECTION – C

(Answer **any 4** questions. Short essay/problem type. **Each** question carries **3** marks.)

15. Rotational and centrifugal distortion constants of HCl molecule are 10.593 cm^{-1} and 5.3×10^{-4} cm^{-1} respectively. Estimate the vibrational frequency and force constant of the molecule.
16. At what temperature are the rates of spontaneous and stimulated emission equal ? Assume $\lambda = 5000$ Å.
17. Explain semiconductor laser.
18. The first line in the rotational spectrum of carbon monoxide has a frequency of 3.8424 cm^{-1}. Calculate the rotational constant and hence the C-O bond length in carbon monoxide. Avogadro number is 6.022×10^{23}/mol.
19. A fiber cable has an acceptance angle of 30° and a core index of refraction 1.4. Calculate the refractive index of the cladding.
20. Describe the recording and reconstruction process holography with the help of suitable diagrams. **(4×3=12)**

SECTION – D

(Answer **any 2** questions. Long essay type. **Each** question carries **5** marks.)

21. Using suitable diagram explain principle of laser production and explain characteristics of ruby laser.
22. Discuss in detail rotational spectra of a diatomic molecule, considering it as a rigid rotator.
23. Briefly explain an optical fiber. Using ray theory discuss the mechanism of transmission of light within an optical fiber.
24. Discuss the theory of vibrating diatomic molecule. **(2×5=10)**
