K20U 0139

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, April 2020
(2014 Admission Onwards)
Core Course in Physics
6B12 PHY : PHOTONICS AND SPECTROSCOPY

Max. Marks : 40

Time : 3 Hours

Instruction : *Write answers in* ***English*** *only.*

SECTION – A

(Answer **all** – Very short answer type – **Each** question carries **one** mark.)

1. Give an example of asymmetric top molecule.
2. The wavelength of light in He-Ne laser is _____.
3. The inner part of optical fiber is called _____.
4. The selection rule for rotation level transition is _____.

SECTION – B

(Answer **any seven** – Short answer type – **Each** question carries **two** marks.)

5. What is meant by numerical aperture of an optical fiber ?
6. What are the different types of energies possessed by a molecule ?
7. Briefly explain : Acceptance angle and critical angle.
8. Discuss two applications of holography.
9. Define cavity life time.
10. List any four applications of Laser.

P.T.O.

11. Define symmetric molecule. Give an example.

12. What is the change in the rotational constant B when hydrogen is replaced by deuterium in the hydrogen molecule ?

13. Mention the advantages of optical fiber sensor over conventional sensors.

14. What is meant by population inversion in laser ?

SECTION – C

(Answer **any four** – Short essay/problem type – **Each** question carries **three** marks.)

15. The force constant of the bond in CO molecule is 187N/3 and its reduced mass is 1.14×10^{-26} kg. Compute the frequency of vibrations of the CO molecule and the spacing between its vibrational energy levels.

16. Calculate the numerical aperture and acceptance angle of an optical fiber with core n = 1.55 and cladding n = 1.5.

17. State and explain Morse function for molecules.

18. Discuss any one application of an optical fiber as a sensor.

19. The first line in the rotation spectrum of carbon monoxide has a frequency of 3.8424 cm^{-1}. Calculate the rotational constant and hence the C – O bond length of carbon monoxide.

20. A ruby laser beam with wavelength 690 nm is incident on an object. The power of the beam is 25 mW and diameter is 1.25 mm. Determine the intensity of the laser beam falling on the object.

SECTION – D

(Answer **any two** – Long essay type – **Each** question carries **five** marks.)

21. What are the properties of Laser ? Define Einstein co-efficients. Derive the relation between Einstein co-efficients.

22. Discuss how a diatomic molecule having a rotating vibrator could explain the features of near infra-red absorption spectra.

23. Briefly explain an optical fiber. Using ray theory discuss the mechanism of transmission of light with in an optical fiber.

24. Obtain an expression for the rotational energy levels of a diatomic molecule taking it as a rigid rotator. Discuss its spectrum and the relevant selection rule.