



DR-003-1016033

Seat No. _____

B. Sc. (Sem. VI) (CBCS) (W.E.F. 2016) Examination

April - 2022

Physics : P-603

(Spectroscopy And Applied Optics) (Old Course)

Faculty Code : 003

Subject Code : 1016033

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) All questions are compulsory.
(2) Figures on right side indicate full marks.
(3) Symbols have their usual meaning.

- 1 (A) Objective type questions : 4
- (1) When a single spectral line is split up into three components is known as _____ Zeeman effect.
 - (2) In a _____ effect the effect of electric field on spectral line is studied.
 - (3) _____ component is absent in parallel view of Zeeman effect.
 - (4) In the spectrum of sodium D lines, the doublet separation is _____ \AA
- (B) Answer in brief : (any one) 2
- (1) The radiation given off by excited Hg atoms returning to their ground state gives a spectral line at 2537\AA . Find the corresponding photon energy ($h=6.62 \times 10^{-34}$ J-sec),
 - (2) Explain the space (special) quantization.
- (C) Answer in detail : (any one) 3
- (1) Explain classical interpretation of normal Zeeman effect.
 - (2) Write a note on Stark effect.

- (D) Write a note on : (any one) 5
- (1) Write a note on experimental study of Zeeman effect.
 - (2) Explain Paschen - Back effect.
- 2 (A) Objective type questions : 4
- (1) A band has a sharp intense edge on one side is called _____.
 - (2) _____ is the most complex molecular spectra.
 - (3) Raman lines are strongly_____.
 - (4) Raman spectra consists anti-stokes lines when $\Delta\nu$ is _____.
- (B) Answer in brief : (any one) 2
- (1) The moment of inertia of the CO molecule is 1.46×10^{-46} kg. m². Calculate the energy in eV.
($M_r = 1$ and $h = 6.62 \times 10^{-31}$ J.sec)
 - (2) Write the importance of Raman effect.
- (C) Answer in detail : (any one) 3
- (1) Explain the theory of rotational - vibrational spectra.
 - (2) Explain quantum theory of Raman effect.
- (D) Write a note on : (any one) 5
- (1) Explain the theory of pure rotational spectra.
 - (2) Explain experimental arrangement of Raman spectra.
- 3 (A) Objective type questions : 4
- (1) Ruby laser has a _____ level pumping scheme.
 - (2) In Nd-YAG laser _____ ions are active centres.
 - (3) He-Ne is a _____ laser.
 - (4) _____ laser used in CD players.
- (B) Answer in brief : (any one) 2
- (1) Write characteristics of spontaneous emission.
 - (2) Explain metastable state in laser.

- (C) Answer in detail : (any one) 3
- (1) What is pumping ? Discuss four level pumping scheme.
 - (2) Derive the Einstein's relation.
- (D) Write a note on : (any one) 5
- (1) Explain construction and working of He-Ne laser.
 - (2) Explain : Holography.
- 4 (A) Objective type questions : 4
- (1) Formation of Laue spots can be explained with the help of _____ law.
 - (2) In Coolidge tube a block of _____ metal is used as a target.
 - (3) Who discovered X-rays ?
 - (4) Give the expression for Bragg's law.
- (B) Answer in brief : (any one) 2
- (1) Find the wavelength of 2nd order X-rays by NaCl crystal at an angle of 4.5° .
 - (2) Write the properties of X-rays.
- (C) Answer in detail : (any one) 3
- (1) Obtain the Brillion zone of simple cube lattice.
 - (2) Explain the formation of Laue spots.
- (D) Write a note on : (any one) 5
- (1) Obtain the expression for Bragg's law and write the important conclusions.
 - (2) Explain rotating crystal method for X-ray diffraction.
- 5 (A) Objective type question : 4
- (1) Core is surrounded by co-axial middle region known as the _____.
 - (2) Optical fibre works on the principle of _____.

(3) _____ is the measure of how much light can be collected by an optical fibre.

(4) _____ is used as a source of light in optical fibre.

(B) Answer in brief : (any one) **2**

(1) Calculate the NA of an optical fibre with a clad index of 1.50 and core index of 1.55.

(2) What is single mode fiber ?

(C) Answer in detail : (any one) **3**

(1) Discuss : Attenuation

(2) Derive an expression of NA for step index fibre.

(D) Write a note on : (any one) **5**

(1) Explain the types of optical fibre.

(2) Explain fibre optics communication system with block diagram.
