



JC-003-1016033

Seat No. _____

B. Sc. (Sem. VI) (CBCS) Examination

August – 2019

603 : Physics

(New Course)

Faculty Code : 003

Subject Code : 1016033

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

[Total Marks : 70

- Instructions :** (1) All questions are compulsory.
(2) Symbols have their usual meanings.
(3) Figures to the right indicate marks.

- 1 (A) Answer the following in short : 4
- (1) Who introduced the concept of spinning electron?
 - (2) Band Spectra is also known as _____ spectra.
 - (3) Which type of spectra are also known as fluted spectra?
 - (4) The orbital quantum number (ℓ) defines _____ of an orbit.
- (B) Answer in brief : (Any **One**) 2
- (1) Calculate the ionization potential for mercury atom corresponding to spectrum term 83408 cm^{-1} .
 - (2) Calculate the wavelength of light emitted by an atom excited to some higher state by $4V$.
- (C) Answer in detail : (Any **One**) 3
- (1) Describe Franck-Hertz experiment.
 - (2) Explain Stark effect.

- (D) Write Notes on : (Any **One**) 5
- (1) Explain Vector atom model and Normal Zeeman effect.
 - (2) Explain classical interpretation of Normal Zeeman effect.
- 2 (A) Answer the following in short : 4
- (1) In Raman spectra, the lines of the same frequency as the incident light are known as _____ lines.
 - (2) Write the range of Raman shift.
 - (3) The molecular spectrum is also known as _____ spectrum.
 - (4) A diatomic molecule has rotational motion as well as _____ motion.
- (B) Answer in brief : (Any **One**) 2
- (1) The exciting line in a Raman experiment is 5460Å and stokes line is at 5520Å Find the wavelength of antistokes lines.
 - (2) The moment of inertia of the CO molecule is $1.46 \times 10^{-46} \text{ kgm}^2$. Calculate the energy in eV.
- (C) Answer in detail : (Any **One**) 3
- (1) Compare Raman spectra and Flourescence spectra.
 - (2) Explain the theory of electronic spectrum.
- (D) Write Notes on : (Any **One**) 5
- (1) Explain the experimental arrangement for observing Raman Effect.
 - (2) Explain pure rotational spectrum and derive the necessary equations.

- 3 (A) Answer the following in short : 4
- (1) Give the full form of LASER.
 - (2) Which are the three processes that can occur when a photon travels through a medium?
 - (3) Define population inversion.
 - (4) What is the ratio of He: Ne in HeNe laser?
- (B) Answer in brief : (Any One) 2
- (1) At what temperature are the rates of spontaneous and stimulated emissions equal, for a wavelength $\lambda = 5000 \text{ \AA}$?
 - (2) The emitted laser light has a wavelength 6000 \AA and the coefficient of spontaneous emission is $10^6 / s$. Determine the coefficient for stimulated emission. [Take $\mu = 1$].
- (C) Answer in detail : (Any One) 3
- (1) Explain the condition for stimulated emission to dominate spontaneous emission.
 - (2) Explain LIDAR.
- (D) Write Notes on : (Any One) 5
- (1) Explain the principle of holography.
 - (2) Explain the construction and working of Ruby laser.
- 4 (A) Answer the following in short : 4
- (1) Who discovered X-rays?
 - (2) Write the properties of the target material in Coolidge tube.
 - (3) Write the types of X-ray spectra.
 - (4) Write the expression for Bragg's law.
- (B) Answer in brief : (Any One) 2
- (1) Calculate the minimum voltage that must be applied to an X-ray tube to produce X-ray photons of wavelength $\lambda = 1 \text{ \AA}$
 - (2) Find the wavelength of second order X-rays reflected by NaCl crystal at an angle of 4.5° . The grating element of NaCl crystal is 2.81 \AA .

- (C) Answer in detail : (Any **One**) **3**
- (1) Write any six properties of X-rays.
 - (2) Explain Laue method of diffraction of X-rays.
- (D) Write Notes on : (Any **One**) **5**
- (1) Give the construction and working of Coolidge tube.
 - (2) State and prove Bragg's law.
- 5** (A) Answer the following in short : **4**
- (1) Give equation of Snell's law.
 - (2) What are the different types of modes?
 - (3) What is critical angle?
 - (4) Write the expression for fractional refractive index.
- (B) Answer in brief : (Any **One**) **2**
- (1) What is the numerical aperture of an optical fibre cable with a clad index of 1.277 and core index of 1.872?
 - (2) Calculate the fractional index change of a given optical fibre, if the refractive indices of core and cladding are 1.563 and 1.498 respectively.
- (C) Answer in detail : (Any **One**) **3**
- (1) Explain optical fibre in detail.
 - (2) Give six merits of fibre optics.
- (D) Write Notes on : (Any **One**) **5**
- (1) Explain different types of optical fibre in detail.
 - (2) Explain the application of fibre optics in communication system.