DCK-003-1016033 Seat No. _____

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

July - 2022

Physics : P - 603

(Spectroscopy & Applied Optics)

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 on right side indicates the marks.

1 (a) Answer all the questions : **4**

(1) Number of electron in a shell is limited by equation _____.

(2) True or False : $m_l = l \cot\theta$.

(3) Magnetic total angular momentum quantum number is denoted by _____.

(4) True or False : The idea of electron spin was introduced by Bohr.

(b) Answer in brief : (any **1** out of 2) **2**

(1) What is orbital quantum number?

(2) What is fine structure?

(c) Answer the following questions : (any **1** out of 2) **3**

(1) Explain anomalous Zeeman effect.

(2) What is stark effect?

(d) Answer the following questions : (any **1** out of 2) **5**

(1) Explain in detail vector atom model and normal Zeeman effect.

(2) Explain in detail Paschen-Back effect.

2 (a) Answer all the questions : **4**

(1) True or False : Electronic-band spectra is the most complex of molecular spectra.

(2) The rotational spectra are not observed for diatomic molecules such as _____.

(3) True or False : Raman lines are polarised.

(4) If $\Delta\nu$ is positive in Raman effect than we obtain _____ line.

(b) Answer in brief : (any **1** out of 2) **2**

(1) What is band head in molecular spectra?

(2) Draw the experimental set up of Raman Effect.

(c) Answer the following questions : (any **1** out of 2) **3**

(1) Write the difference among the molecular spectra.

(2) Write applications of Raman effect.

(d) Answer the following questions : (any **1** out of 2) **5**

(1) Explain in detail pure rotational spectra.

(2) Explain in detail quantum theory of Raman Effect.

3 (a) Answer all the questions : **4**

(1) True or False : In stimulated emission the net intensity is given by N^2I.

(2) Ruby Laser has a _____ level pumping scheme.

(3) He-Ne Laser is a _____ laser.

(4) P-N junction diode operates in _____ region.

(b) Answer in brief : (any **1** out of 2) **2**

(1) Define pumping process.

(2) Define stimulated emission.

(c) Answer the following questions : (any **1** out of 2) **3**

(1) For laser action, explain three level pumping scheme.

(2) Write note on optical resonant cavity.

(d) Answer the following questions : (any **1** out of 2) **5**

(1) Obtain the Einstein relationship.

(2) Explain Ruby Laser in detail.

4 (a) Answer all the questions : **4**

(1) True or False : Powder method is applicable to single crystal specimen only.

(2) The wavelength of X-ray is the order of _____.

(3) True or False : From Lame spot experiment it is clear that X-rays are charged particles.

(4) Metal used as target in Coolidge tube should have _____ conductivity.

(b) Answer in brief : (any **1** out of 2) **2**

(1) Define line spectra of X-ray.

(2) Give the uses of Lave's spot.

(c) Answer the following questions : (any **1** out of 2) **3**

(1) Explain continuous spectra of X-rays.

(2) Write medical applications of X-rays.

(d) Answer the following questions : (any **1** out of 2) **5**

(1) State and prove Bragg's law.

(2) Give the properties of X-rays.

5 (a) Answer all the questions : **4**

(1) What happens if the angle ϕ_1 is less than the critical angle ϕ_c ?

(2) Write the formula of fractional refractive index.

(3) Multimode fibre is classified according to distribution of _____.

(4) True or False : The intensity is proportional to the square of the amplitude.

(b) Answer in brief : (any **1** out of 2) **2**

(1) Write the difference between monomode and multimode fibre.

(2) Define critical angle of propagation in fibre optics.

(c) Answer the following questions : (any **1** out of 2) **3**

(1) Derive the expression of NA for step index fibre.

(2) Write the advantages of the optical fibre.

(d) Answer the following questions : (any **1** out of 2) **5**

(1) Draw the block diagram of fibre optics communication system and discuss the function of its components.

(2) Give the applications of an optical fibre in detail.
