Exam. Code : 103204

Subject Code : 1355

B.A./B.Sc. Semester–IV

PHYSICS

(Atomic Spectra & Lasers)

Paper—B

Time Allowed—3 Hours]   [Maximum Marks—35

Note : Section A is compulsory. Attempt **ONE** question each from Sections B, C, D and E. All questions carry equal marks.

SECTION—A

I. Attempt all the **seven** parts :

  (a) Calculate energy of Helium atom in eV corresponding to second excited state.

  (b) Write down possible values of J for L=2 and S=1/2.

  (c) What is the difference between Zeeman effect and Stark effect ?

  (d) Calculate Lande's g factor for L=1 and S=1/2 and J=1/2.

  (e) Why four level laser is preferred over three level laser ?

  (f) What are identical particles ?

  (g) What is a metastable state ?   1×7=7

2668(2517)/STB-13945   1   **(Contd.)**

SECTION—B

II. (a) How spin orbit interaction helps to understand fine structure ? 5

(b) Describe Franck-Hertz experiment and give its significance. 2

OR

III. (a) Discuss quantum mechanical theory of Zeeman effect and calculate Zeeman shift by taking an example. 5

(b) Calculate possible orientations of orbital angular momentum (L=2) corresponding to specified direction of magnetic field. 2

SECTION—C

IV. What are symmetrical and anti-symmetrical wave functions ? Explain Pauli's exclusion principle on the basis of these functions. 7

OR

V. Discuss the spectrum of He atom in reference to parahelium and orthohelium by drawing an energy level diagram. 7

SECTION—D

VI. Discuss population inversion, Why it can not take place through optical pumping in two level system ? Calculate Threshold pumping power per unit volume. 7

OR

VII. (a) How does quality factor affect the sharpness of resonator ? Derive an expression for it. 3

(b) Derive Fuchbauer-Landenberg formula. 4

SECTION—E

VIII. Describe different components of laser device. Give necessary conditions for laser action. 7

OR

IX. Write short notes on :

(i) Q switching

(ii) Holography

(iii) Spiking in Ruby lasers. 7