

Exam. Code : 103204

Subject Code : 1306

B.A./B.Sc. 4th Semester

PHYSICS

Paper—B (Atomic Spectra and Lasers)

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. (a) Is ${}^2S_{3/2}$ a possible term ? Why ?
(b) What are singlet and doublet terms in atomic spectroscopy ?
(c) Is it possible to observe Stern-Gerlach experiment with homogeneous magnetic field ?
(d) Calculate Lande's g-factor for state ${}^2P_{1/2}$.
(e) What is necessary condition for light amplification in LASER ?
(f) How resonant cavity multiply number of photons ?
(g) What are main features of LASER light ?

1×7=7

SECTION—B

- II. What do you mean by space quantization of electron spin ? Explain it by Stern-Gerlach experiment. 7

OR

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(Contd.)

- III. What is normal Zeeman Effect ? How we can determine charge/mass (e/m) for electron by measuring Zeeman shift for a particular given wavelength ? 7

SECTION—C

- IV. Discuss L-S coupling. Write its spectroscopic notations for spectral terms. Write spectral terms for two equivalent electrons in P^2 configuration. 7

OR

- V. Discuss two forms of Helium due to difference of energies in its singlet and triplet states. Draw allowed transitions in Helium spectra using selection rules for transitions. 7

SECTION—D

- VI. Derive relation between Einstein's spontaneous and stimulated emission coefficients. 7

OR

- VII. What is difference between three level and four level pumping schemes ? Write some advantages of four level pumping over three level pumping. 7

SECTION—E

- VIII. What is a pulsed LASER ? How laser pulse is generated in Ruby Laser ? Discuss its construction and working. 7

OR

- IX. Discuss the construction and working of CO_2 LASER. Draw energy level diagram for transitions between energy levels of CO_2 molecule. 7