Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name: Atomic and Molecular Physics

Subject Code: 5SC02AMP1 **Branch: M.Sc. (Physics)**

Semester: 2 **Date: 25/04/2018** **Time: 10:30 To 01:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator and any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

SECTION – I

Q-1 **Attempt the Following questions** **(07)**

a. Draw the vector diagram for LS and JJ coupling
b. Differentiate between Zeeman and Anomalous Zeeman effect
c. What do you mean by Central field?
d. What are **π** and **σ** components of spectral lines?
e. Give the expression to find probability density of electrons.
f. State the advantages of Thomas-Fermi over Hartree model used in central field approximations
g. Give the splitting of spectral lines in terms of frequency in normal Zeeman effect.

Q-2 **Attempt all questions** **(14)**

a. Give an account on L-S coupling and deduce the expression for interaction energy. **08**
b. Explain the experimental setup used for Zeeman Effect **06**

OR

Q-2 **Attempt all questions** **(14)**

a. How Vector Atom model helps to explain Anomalous Zeeman Effect? **07**
b. Discuss the Thomas-Fermi model to understand Central field approximation **07**

Q-3 **Attempt all questions** **(14)**

a. Explain Normal Zeeman Effect using Vector Atom Model **08**
b. Write a note on Central Field Approximations **06**

OR

Q-3 **a.** Discuss in detail the Hartree theory for Central Field estimation **06**
b. Derive the interaction energy term for JJ coupling **08**

SECTION – II

Q-4 **Attempt the Following questions** **(07)**

a. What do you mean by Spontaneous emission?
b. What are Einstein coefficients?
c. Which one is better for explaining ionic bonds,VBT or MOT? Why?
d. Give the expression for frequency of a rigid rotator
e. Define Compton effect
f. What do you mean by reduced mass?
g. Define Pair production

Q-5 **Attempt all questions** **(14)**

a. Write a note on LCAO **07**
b. Derive the expression for frequency of a rigid rotator **07**

OR

Q-5 **a.** Discuss the processes: Absorption and Stimulated emission and comment on the Einstein coefficients. **07**
b. Explain the different ways in which radiation interact with matter **07**

Q-6 **Attempt all questions** **(14)**

a. Explain in detail the Born-Oppenheimer Approximation **09**
b. Give the similarities and dissimilarities between VBT and MOT **05**

OR

Q-6 **Attempt all Questions**

a. Compare in detail how VBT and MOT can explain the bond formation in molecules. **07**
b. Discuss diatomic molecule as a harmonic oscillator **07**