Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Sc. (Non Medical) (Sem.–5)

QUANTUM MECHANICS

Subject Code : BSNM-504-18

M.Code : 78618

Date of Examination : 23-12-22

Time : 3 Hrs. **Max. Marks : 50**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Why photon have zero-rest mass energy?

b) What is the energy of photon having wavelength 1 Å?

c) What is a free electron in terms of quantum numbers?

d) Write the short comings of classical mechanics.

e) What do you understand by eigen values and eigen function?

f) Define degenerate state.

g) What is the range of r, □, Φ in spherical polar coordinates?

h) Define expectation value.

i) What is the importance of normalization of wave function?

j) Define Hamiltonian operator.

SECTION-B

2. Discuss how Stern-Garlach experiment can be used to explain space quantisation and electron spin.

3. Differentiate between Normal and Anomalous Zeeman effect.

4. Define Uncertainty principle. Calculate the uncertainty in the position of an electron weighing $9\times l0^{-28}$ gm and moving with an uncertainty in speed of 3×19^{9} cm/sec.

5. Explain the physical significance of various quantum numbers involved in the quantum theory of hydrogen atom.

6. Derive Schrodinger time dependent equation.

SECTION-C

7. Show that probability current density J together with probability density $\rho = \psi\psi^*$ satisfies the equation of continuity

$$\frac{\partial \rho}{\partial t} + \nabla . J = 0$$

8. Solve Schrondinger equation for one-dimensional harmonic oscillator to find its zero-point energy.

9. Derive Schrodinger wave equation for H-atom using spherical polar- coordinates.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.