

Mid-West University
Examinations Management Office

End Semester Examinations-2080

Master level/ M.Sc.(Physics)/2nd Semester

Time: 3 hours

Subject: Quantum Mechanics II (PHY552)

Full Marks: 37.50

Pass Marks: 18.75

Candidates are required to give their answer in their own words as far as Practicable. The figures in the margin indicate full marks.

Attempt all the questions:

1. What do you mean by spin of electron? Explain the mathematical description of spin. Also discuss the wave function of spin of electron. [10]
2. Explain the quantum mechanical treatment of hydrogen molecule.

OR

Explain the mass correction formula of hydrogen atom. Also discuss about the spin orbit interaction and fine structure of hydrogen atom based on mass correction formula. [10]

3. Explain about the Born Oppenheimer method for the separation of nuclear and electronic motion of molecules.

OR

Discuss the Rabi formula for probability of finding the system based on quantum resonance phenomena. [5]

4. Explain the quantum mechanical solution of one dimensional harmonic oscillator using momentum space. [5]
5. Show that every 2×2 matrix $\begin{pmatrix} u_{11} & u_{12} \\ u_{21} & u_{22} \end{pmatrix}$ can be expressed by 1 & $\hat{\sigma}_i$. [5]
6. Explain Fortrat diagram for the analysis and representation of the rotational structure of molecular spectra.

OR

Discuss about the scattering matrix which describes the series of time evolution transformation. [2.5]

The End