M.SC.(Physics) (CBCS Pattern) Third Semester PSCPHYT09-Core-IX - Quantum Mechanics-II Paper-IX

P. Pag Time	ges : : Thr	$\frac{1}{2}$ There Hours $\frac{1}{2} = \frac{1}{2} = $	GUG/W/18/11295 Max. Marks : 80
1.		Either	
	a)	Define stark effect. Explain first order stark effect in the ground and first e H-atom.	excited state of 8
	b)	State different approximation methods and gives the perturbation theory o independent non degenerate system.	f first order time 8
		OR	
	e)	Explain the applications of perturbation theory to ground state energy.	8
	f)	Define normal and anomalous Zeeman effect. Explain these effects with n diagrams.	eat energy 8
2.		Either	
	a)	Discuss time dependent perturbation theory and derive the expression of F rule of probability transition.	Fermi-Golden 8
	b)	Calculate the ground state energy of He Atom using variational principle.	8
		OR	
	e)	What are Einstein's A and B coefficients? Derive equations for them.	8
	f)	What is mean by barrier penetration? Explain use of W.K.B. method in ba	rrier penetration 8
3.		Either	
	a)	Explain scattering theory of quantum particle. using Partial wave method.	8
	b)	Explain the Heitler-London theory of the hydrogen Molecule.	8
		OR	
	e)	Derive the expressions of wave function and energy of the Ortho and Para Helium atom and their perturbation by coulomb repulsion.	states of the 8
	f)	What is Born approximation? Explain its validity in scattering theory.	8
4.		Either	
	a)	Explain spin-orbit interaction for Dirac's particles.	8
	b)	Solve Klein – Gordon equation for a free particle and discuss its limitation	as. 8

e) Discuss the solution for hydrogen atom in Dirac's theory. 8 f) Prove that Dirac's electron has a magnetic dipole moment. 8 $\vec{\mu} = \frac{\mathbf{e} \cdot \vec{h} \cdot \vec{r}}{2 \cdot \mathbf{m} \cdot \mathbf{c}}$ Attempt **all** the following. a) Explain second order stark effect in H-atom. 4 Explain Yukawa potential in deuteron. b) 4 What is resonant scattering? Explain? c) 4 d) Give the physical significance of negative energy states. 4

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