PHYSICS QUESTIONS

Tanmay Agarwal

1 Tensor Physics

1. Derive the Affine connections

2. Show that the transformation of affine connections is not a tensor

3. Write the different transformations of covariant tensors

4. Write the different transformations of contra-variant tensors

5. Define the co-variant derivative in all forms of tensors

6. Derive the christoffer symbols tron mbo trms 7. Define the notation for laplacian in tensor notations

8. Derive the Divergence in tensor notations

9. Define the relation between $A^{'}$ and A vectors

10. Derive the metric tensor for cylindrical and spherical co-ordinates

11. Derive the divergence in spherical co-ordinates

12. Derive the divergence in Cylindrical co-ordinates

13. Derive the laplacian in Spherical co-ordinates

14. Derive the laplacian in Cylindrical co-ordinates

15. Derive the complete curvature tensor and show its transformations

16. Define the metric tensor

2 Quantum Mechanics

1. Define the theorem of superposition of different states
2. Define the basis of eigen states as a integral over fourier transforms
3. Define the symmetry rules for an infinitesimal change in $f(x)$
4. Write down the expansion of basis in the position space
5. Define in detail the Bra-Ket notations
6. Write about the role of probabilities in Quantum Physics
7. Define about normalization of the wave function
8. Explain in detail about the formation of wavefunction
9. Define the operators of momentum and energy

10, Define the energy eigen value equations

11. Derive the time dependent wavefunction for energy eigen functions

$$(\frac{mw}{\hbar\pi})^{\frac{1}{4}}(\frac{1}{\sqrt{2!n!}}H_n(\sqrt{\frac{mw}{e}}x)e^{-\frac{mwx^2}{2\hbar}}) \tag{1}$$