Assignment-8

Due on 2021-02-23, 23:59 UTC

The due date for completing this assignment has passed. As our record shows you have not submitted this assignment.

1. Using the group theoretical approach in physics,
   - Explain the group theoretical approach in physics.
   - Discuss how it is used in various fields of physics.
   - How it helps in predicting the behavior of particles.

2. The Hermitian operator which generates rotational time translation is
   - Describe the properties of Hermitian operators.
   - Explain how they are related to symmetries.
   - Discuss the role of Hermitian operators in quantum mechanics.

3. The matrix representation of the Lorentz boost generator along x direction is
   - Provide the matrix representation.
   - Explain how this matrix relates to the Lorentz transformation.
   - Discuss its significance in special relativity.

4. The number of independent parameters of 4D(4) must be
   - Explain the concept of independent parameters.
   - Discuss how this number is derived for 4D(4).
   - What does this imply in the context of 4D spacetime?

5. The number of generators of unitary group U(4) is
   - Describe the properties of unitary groups.
   - Explain the significance of U(4) in particle physics.
   - Discuss the role of these generators in quantum mechanics.

6. Notice that the representation form of the Frobenius norm is
   - Provide the representation form.
   - Explain how this is used in quantum mechanics.
   - Discuss its importance in the study of quantum states.

7. If the generator of boosts along x axis is $\mathbf{K}_x$, and generator of rotation about z-axis is $\mathbf{J}_z$, then the commutator $[\mathbf{K}_x, \mathbf{J}_z]$ is.
   - Provide the commutator formula.
   - Explain why this is important in quantum mechanics.
   - Discuss its implications for observable quantities.

8. Group methods in 3DCC is a system of values,
   - Describe the concept of group methods.
   - Explain how they are used in 3DCC.
   - Discuss their significance in theoretical physics.

9. Lorentz group is a non-compact group on the spacetime picture of special relativity are arising there – we use it. The
   - Explain the role of Lorentz groups.
   - Discuss their significance in special relativity.
   - Explain why they are non-compact.

10. Group $SU(2)$ has many number of generations on 3DCC.
   - Describe the properties of $SU(2)$.
   - Explain how it relates to generations.
   - Discuss its significance in the context of 3DCC.