**Collaborators :** None

**Sources** : Lecture Notes

**Q5 Dirac notation and measurement exercises**

**5-a)**

Let

Then,

**5-b)**

What number, , should be divided by to make it a “normalized” state; i.e., a unit vector? For future reference, define to be this state vector.

**5-c)**

What are the possible outcomes and associated probabilities if ∣*ψ*⟩ is measured in the standard basis?

For readout as ∣0⟩, the associated probability =

For readout as ∣1⟩, the associated probability =

**5-d)**

Measurement in basis:

Equation-1 :

Similarly,

For readout in , the associated probability =

For readout in , the associated probability =

**5-e)**

Verify that and form an orthonormal basis for . (These two vectors are sometimes called ∣i⟩ and ∣−*i*⟩.) Then do the prior question for measuring in the {∣*i*⟩,∣−*i*⟩} basis.

Measurement in basis:

Equation-1 :

Similarly,

For readout in , the associated probability =

For readout in , the associated probability =