EE5PPC30: Algorithms for Quantum Computing

Assignment # 1 (will count towards 4% of total) Due before 30 Sep 24 5 pm.

1.a) Find the inner product of

$$¿\psi>¿\sqrt{\frac{2}{3}}\vee 01>\frac{+i}{\sqrt{3}}\vee 10>¿\vee\phi\geq\sqrt{\frac{1}{2}}\vee 00>+i\sqrt{\frac{1}{2}}\vee 10>¿$$

b) Find the tensor product of

$$¿\psi>¿\sqrt{\frac{2}{3}}\vee 0>\frac{+i}{\sqrt{3}}\vee 1>¿\vee\phi>¿i\sqrt{\frac{1}{2}}\vee 0>+\sqrt{\frac{1}{2}}\vee 1>¿$$

2. Find the operator ***Z*** that maps the following:

|0> → |0>

|1> → -|1>

Also, find the matrix form of the operator.

3. Consider the operator X which acts as follows on the computational basis states.

X|0> = |1>

X|1> = |0>

Represent the eigenvectors of the operator X in Dirac notation and comment on them.

4. Consider the 2-qubit state

$$¿\psi>¿\frac{1}{\sqrt{2}}\vee 0>¿0>\frac{+1}{\sqrt{2}}\vee 1>¿1>¿.$$

Show that the state is entangled by proving that there are no possible values of $\alpha_0, \alpha_1, \beta_0, \beta_1$ such that

$$¿\psi>¿¿.$$