Homework 2

Started: Feb 28 at 1:39pm

Quiz Instructions

Question 1

2 pts

[**Q28-01**] Which of the following vectors are valid quantum states.

- ☐ $\left(\frac{1}{2}, 0, \frac{1}{2}, 0\right)$
- ☐ $\left(\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right)$
- ☐ $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0, 0\right)$
- ☐ $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$
- ☐ $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$
- ☐ $\left(\frac{2}{3}, \frac{1}{3}, \frac{2}{3}, 0\right)$

Question 2

1 pts

[Q24-01] What is the quantum state obtained after applying H operator to state |1⟩?

- ○ |1⟩
- ○ |+⟩
- ○ |0⟩
- ○ |-⟩

Question 3

2 pts

[**Q28-02**] Which of the following vectors are *not* valid quantum states.

- ☐ $\left(\frac{1}{2}, 0, \frac{1}{2}, 0\right)$
- ☐ $\left(\frac{2}{3}, -\frac{1}{3}, \frac{2}{3}, 0\right)$
- ☐ $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$
- ☐ $(0, -1, 0, 0)$
- ☐ $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0, 0\right)$
- ☐ $\left(\frac{1}{4}, -\frac{1}{4}, -\frac{1}{4}, \frac{1}{4}\right)$

Question 4

2 pts

[**Q32-01**] If the angle of a real valued qubit is x, what is the probability of observing state $|0\rangle$?

- ○ $\cos(x) + \sin(x)$
- ○ $\sin(x)$
- ○ $\cos(x)$
- ○ $\cos^2(x)$
- ○ $\sin^2(x)$

Question 5

2 pts

[**Q12-01**] We have a circuit with a single qubit created with the code given below. What should replace "#Your code here" if we want to apply a NOT operator to the qubit?

```
q =  QuantumRegister(1)
c = ClassicalRegister(1)
```

```
qc = QuantumCircuit(q,c)

#Your code here

qc.measure(q[0],c[0])
job = execute(qc,Aer.get_backend('qasm_simulator'),shots=1024)
counts = job.result().get_counts(qc)
print(counts) # counts is a dictionary
```

Question 6

2 pts

[**Q12-02**] What will be the output of the code shown below?

```
q =  QuantumRegister(1)
c = ClassicalRegister(1)
qc = QuantumCircuit(q,c)

qc.x(q[0])

qc.measure(q[0],c[0])
job = execute(qc,Aer.get_backend('qasm_simulator'),shots=1024)
counts = job.result().get_counts(qc)
print(counts) # counts is a dictionary
```

- ◯ {'11': 1024}
- ◯ {'0': 1024}
- ◯ {'1': 502, '0': 522}
- ◯ {'1': 1024}

Question 7

2 pts

[P20-01} In the quantum coin flipping experiment, what happens when a photon is send through the beam splitter?

- ◯ It is transmitted with probability 1.
- ◯ It is reflected with probability 1.
- ◯ It is reflected with probability 1/4 and transmitted with probability 3/4.
- ◯ It is reflected with probability 1/2 and transmitted with probability 1/2.

Question 8

3 pts

[**Q36-01**] In the following code, what should replace "#Your code here", if we want to create the quantum state $\frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$?

(Hint: Think about the vector representation of this state to start with if you are stuck)

```
q2 = QuantumRegister(1,"qreg")
c2 = ClassicalRegister(1,"creg")
qc2 = QuantumCircuit(q2,c2)

qc2.x(q2[0])
#Your code here

qc2.measure(q2,c2)
job = execute(qc2,Aer.get_backend('qasm_simulator'),shots=100)
counts = job.result().get_counts(qc2)
print(counts) # counts is a dictionary
```

Question 9

2 pts

[**Q12-03**] What will be the output of the following code?

```
q2 = QuantumRegister(2,"qreg")
c2 = ClassicalRegister(2,"creg")
qc2 = QuantumCircuit(q2,c2)

qc2.x(q2[0])

qc2.measure(q2,c2)
job = execute(qc2,Aer.get_backend('qasm_simulator'),shots=100)
counts = job.result().get_counts(qc2)
print(counts) # counts is a dictionary
```

- ◯ {'10': 1024}
- ◯ {'10': 100}
- ◯ {'11': 100}
- ◯ {'01': 100}

Question 10

2 pts

[Q24-02] Suppose a qubit is in state $\begin{pmatrix} 0.43 \\ -0.90 \end{pmatrix}$. What is the amplitude of being in state $|1\rangle$?

- ○ -0.90
- ○ 0.90
- ○ 0.43
- ○ 0.81

Quiz saved at 5:11pm Submit Quiz