QClass 24/25 QKD Homework 2: Quantum Characteristics leading to BB84

Due Dec 23 at 3:59am **Points** 10 **Questions** 10
Available until Dec 23 at 3:59am **Time Limit** 60 Minutes
Allowed Attempts 3

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	25 minutes	8 out of 10

Last Attempt Details:

Time:	25 minutes
Current Score:	8 out of 10
Kept Score:	8 out of 10

2 More Attempts available

Take the Quiz Again

(Will keep the highest of all your scores)

Answers will be shown after your last attempt

Score for this attempt: **8** out of 10
Submitted Dec 22 at 9:13pm
This attempt took 25 minutes.

Question 1

1 / 1 pts

Asja and Balvis pair up their bits by agreed random permutation. BB84 is secure only if this random permutation is kept secret.

- True
- False

Question 2

1 / 1 pts

If a state $|\psi\rangle = \frac{1}{\sqrt{3}}|0\rangle + \sqrt{\frac{2}{3}}|1\rangle$ is measured in Z-basis $\{|0\rangle, |1\rangle\}$, then measurement results in

- state $|0\rangle$ with probability 1/3 and state $|1\rangle$ with probability 2/3
- state $|+\rangle = 1/\sqrt{2}(|0\rangle + |1\rangle)$
- state $|1\rangle$ always
- state $|0\rangle$ always

Question 3

1 / 1 pts

If a state $|+\rangle = \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$ is measured in Z-basis and yields $|0\rangle$, followed by another measurement in X-basis $\{|+\rangle, |-\rangle\}$ which results in

- (●) state $|+\rangle$ or $|-\rangle$ with equal probability
- ( ) state $|+\rangle$ with probability 1
- ( ) None of the given answers
- ( ) state $|-\rangle$ with probability 1

Question 4

1 / 1 pts

In BB84 protocol, Alice can save the resources and send the basis information, together with the corresponding qubit through quantum channel. The protocol will

- (●) become insecure
- ( ) remain secure

Question 5

1 / 1 pts

Complete the following code to **apply X-gates** if bit is equal to 1.

```
qreg = QuantumRegister(8)
creg = ClassicalRegister(8)
asja = QuantumCircuit(qreg, creg, name='Asja')

for i, n in enumerate(send):
    if n==1:
        #YOUR CODE HERE#
```

Make sure to enter the answer as per the correct syntax.

asja.x(qreg[i])

Question 6

1 / 1 pts

In sifting, Asja and Balvis announce the bit values of their shared key.

- ( ) True
- (●) False

Incorrect

Question 7

0 / 1 pts

Knowing how to clone a state $|0\rangle$ we can clone

- $|1\rangle$
- $\frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$
- $\frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$
- $a|0\rangle + b|1\rangle$

Incorrect

Question 8

0 / 1 pts

Following is the code to generate a random string of 8 bits.

```
send=[]
for i in range(8):
    bit = #YOUR CODE HERE#
    send.append(bit)
```

Complete the code and make sure to enter the answer as per the correct syntax.

random.randint(0, 1)

Question 9

1 / 1 pts

Complete the code below to perform a measurement.

```
balvis = QuantumCircuit(qreg, creg, name='Balvis')
SendState(asja, balvis, 'Asja')

#YOUR CODE HERE#
```

Make sure to enter the answer as per the correct syntax.

balvis.measure(qreg, creg)

Question 10

1 / 1 pts

ZX gate applied on state $|+\rangle$ results in

- $|-\rangle$
- $\frac{1}{\sqrt{2}}(|+\rangle - |-\rangle)$
- $\frac{1}{\sqrt{2}}(|+\rangle + |-\rangle)$
- $|+\rangle$

Quiz Score: **8** out of 10

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