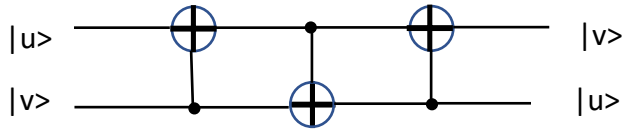
CENG487 Makeup
February 7th - Fall 2021
(100 minutes – 5 Questions)
Name : _____
ID# : _____

Question 1 [20pts]: For a classical bit flip we have assumed that the probability of a bit is flipped is less than or equal to 0.5. Why can we make this assumption? Can we make a similar assumption for qubits?

Question 2 [20pts] The following quantum circuit swaps arbitrary input u and v, write down the matrix representation of the swap operation and show that it is unitary.



Question 3 [15pts]: Assume you are given a qubit that is either |1> or $\cos\theta\ |0> + \sin\theta\ |1>$ states with equal probability, what is the probability of identifying its state if a measurement is made in |0>/|1> basis?

Question 4 [15pts]: Basis vectors |0> and |1> are supposed to be orthonormal, but on the Bloch sphere they do not look orthonormal as they point to South and North poles, respectively. Why?

Question 5 [30pts]: Consider the Grover's search algorithm, is it possible to speed it up by performing the reflection not about the mean (M) but about $2 \times M$?