Problem Set 3
CSCE 440/640

Due dates: Electronic submission of the pdf file of this homework is due on **9/21/2016 before 2:50pm** on ecampus.tamu.edu, a signed paper copy of the pdf file is due on **9/21/2014** at the beginning of class.

Name: (put your name here)

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: _____

Read chapter 4 in the lecture notes and make five insightful comments on perusall. Read chapter 6 in the textbook.

Problem 1. (10 points) Exercise 2.24 in the lecture notes.

Solution.

Problem 2. (20 points) Exercise 2.26 in the lecture notes.

Solution.

Problem 3. (20 points) Exercise 2.27 in the lecture notes. (a) Design the circuit, (b) prove the correctness of the circuit and (c) show how to create the state.

Solution.

Problem 4. (20 points)
(a) Exercise 6.1.1 (a) in the textbook KLM (should read Figure 6.1)
(b) Exercise 6.1.1 (b) in the textbook KLM

Solution.

Problem 5. (10 points) Exercise 3.4 in the lecture notes.

Solution.

Problem 6. (20 points) Consider a system of two quantum bits and a controlled-not gate $\lambda_{0,1}(X)$ that has the least significant bit as a control bit and acts on the most significant quantum bit. Dispel the myth that the control bit of the controlled-not gate remains unaffected. Specifically, describe the action of the controlled-not gate on the following four states:

$$|0_H\rangle \otimes |0_H\rangle, \quad |0_H\rangle \otimes |1_H\rangle, \quad |1_H\rangle \otimes |0_H\rangle, \quad |1_H\rangle \otimes |1_H\rangle,$$

where

$$|0_H\rangle = \frac{1}{\sqrt{2}}|0\rangle + \frac{1}{\sqrt{2}}|1\rangle \quad \text{and} \quad |1_H\rangle = \frac{1}{\sqrt{2}}|0\rangle - \frac{1}{\sqrt{2}}|1\rangle.$$

Express the result in terms of the $|0_H\rangle$ and $|1_H\rangle$ basis.

Solution.

Checklist:
☐ Did you add your name?
☐ Did you disclose all resources that you have used?
(This includes all people, books, websites, etc. that you have consulted)
☐ Did you sign that you followed the Aggie honor code?
☐ Did you solve all problems?
☐ Did you submit the pdf file resulting from your latex source file on ecampus?
☐ Did you submit a hardcopy of the pdf file in class?