

**Problem Set 3**  
CSCE 440/640 Fall 2014

**Due dates:** Electronic submission of the pdf file of this homework is due on **9/26/2014 before 1:00pm** on [ecampus.tamu.edu](http://ecampus.tamu.edu), a signed paper copy of the pdf file is due on **9/26/2014** 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 chapter 6 in the textbook.

**Problem 1.** (15 points) Exercise 2.10 in the lecture notes.

**Solution.**

**Problem 2.** (20 points) Exercise 2.11 in the lecture notes. [Hint: Taking square roots of matrices will turn out to be useful.]

**Solution.**

**Problem 3.** (15 points) Exercise 2.12 in the lecture notes.

**Solution.**

**Problem 4.** (10 points) Exercise 2.13 in the lecture notes.

**Solution.**

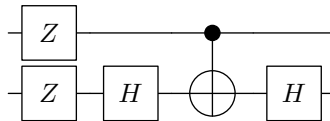
**Problem 5.** (10 points) Exercise 2.16 in the lecture notes.

**Solution.**

**Problem 6.** (10 points) Exercise 3.4 in the lecture notes.

**Solution.**

**Problem 7.** (20 points) Consider the quantum circuit:



Suppose that the input to the circuit is  $|10\rangle$ . Describe the evolution of the state

- (A) After the first two  $Z$  gates.
- (B) After the first Hadamard gate  $H$
- (C) After the controlled-not gate.
- (D) After the last Hadamard gates  $H$ .

**Solution.**

Discussions on piazza are always encouraged, especially to clarify concepts that were introduced in the lecture. However, discussions of homework problems on piazza should not contain spoilers. It is okay to ask for clarifications concerning homework questions if needed.

**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?