CSCE 222 [Sections 502, 503] Discrete Structures for Computing
Spring 2017 – Hyunyoung Lee

Problem Set 8

Due dates: Electronic submission of *yourLastName-yourFirstName-hw8.tex* and *yourLastName-yourFirstName-hw8.pdf* files of this homework is due on **Monday, 4/10/2017 *before* the beginning of class** on `http://ecampus.tamu.edu`. You will see two separate links to turn in the .tex file and the .pdf file separately. Please do not archive or compress the files. A signed paper copy of the pdf file is due on **Monday, 4/10/2017** at the beginning of class. **If any of the three submissions are missing, your work will not be graded. Late submissions of any form will not be accepted.**

Name: Joseph **Section: Martinsen**

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

http://math.stackexchange.com/questions/881005/find-the-recurrence-relation-for-the-number-of-bit-strings-that-contain-the-stri

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: ______________________________

In this problem set, you will earn total $100 + 10$ (extra credit) points.

Problem 1. (10 points) Section 6.4, Exercise 38, page 422

Solution.

$$\begin{aligned} n(n+1)\cdot 2^{n-1} &= n(n-1+2)\cdot 2^{n-2} \\ &= n(n-1)\cdot 2^{n-2} + n2^{n-1} \end{aligned}$$

$n(n-1)\cdot 2^{n-2}$ corresponds to the number of ways of choosing a subset of n elements when the two elements are different.
$n2^{n-1}$ corresponds to the number of ways of choosing a subset of set of n elements when the 2 elements are the same.
$\therefore$ the number of ways to choose a subset of of a set of n elements with 2 separate items that may or may not be differential-able is given in the statement.

Problem 2. (10 points) Section 8.1, Exercise 10, page 511 [Hint: Let s_n denote the number of bit strings of length n that contain the string 01. One of the initial conditions is $s_0 = 0$.]

Solution.

(a)

$$\begin{aligned} a_n &= a_{n-1} + 2^{n-1} + 2^{n-3} + \cdots + 2^{n-n} \\ r &= \frac{1}{2} \\ a_n &= a_{n-1} + 2^{n-1} - 1 && \textbf{by Geometric Summation} \end{aligned}$$

(b) $s_0 = 0 \qquad s_1 = 0$

(c) Using python I was able to compute the following:

Problem 3. (10 points) Section 8.1, Exercise 28, page 512. This problem has two parts as below.

Solution.
a) (4 points) Show that the Fibonacci numbers satisfy ...
b) (6 points) Use this recurrence relation to show that ... (prove by induction on n)

Problem 4. (10 points) Section 8.1, Exercise 32 a), b), c) and d), page 512

Solution.

Problem 5. (5×8 pts = 40 points) Section 8.2, Exercise 4 a), b), c), d), and e), page 524. *For each subproblem, prove by induction that the closed form solution you found is correct. Each subproblem is worth 8 points: 3 points for the closed form solution and 5 points for the correct induction proof.*

Solution.

Problem 6. (10 points) Section 8.2, Exercise 8, pages 524–525

Solution.

Problem 7. (10 points) Section 8.4, Exercise 6 a), b), c), d) and e), page 549

Solution.

Problem 8. (10 points) Section 8.4, Exercise 8 a), b), c), d) and e), page 549

Solution.

Checklist:
- ☐ Did you type in your name and section?
- ☐ 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 both the .tex and .pdf files of your homework separately to the correct link on eCampus?
- ☐ Did you submit a signed hardcopy of the pdf file in class?