CSCE 222 Discrete Structures for Computing – Fall 2023
Hyunyoung Lee

Problem Set 7

Due dates: Electronic submission of *yourLastName-yourFirstName-hw7.tex* and *yourLastName-yourFirstName-hw7.pdf* files of this homework is due on **Monday, 11/20/2023 before 11:59 p.m.** on `https://canvas.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. **If any of the two files are missing, you will receive zero points for this homework.** Your files must contain your first and last names and UIN in the given spaces and the electronic signature (your full name) correctly.

Name: Kevin Lei   **UIN: 432009232**

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 answer this homework.

Electronic signature: _Kevin Lei_

Total $100 + 10$ (bonus) points. *Explanation will be about 90% of the grade for each problem.*

The intended formatting is that this first page is a cover page and each problem solved on a new page. You only need to fill in your solution between the `\begin{solution}` and `\end{solution}` environment. Please do not change this overall formatting.

Checklist:
☐ Did you type in your name and UIN?
☐ 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 to each correct link on Canvas?

Problem 1. (20 points) Section 13.1, Exercise 13.4. Explain your reasoning carefully, including (but not limited to) why you set up your generating function in the way you do.

Solution.

Problem 2. (15 points) Section 13.2, Exercise 13.7. Explain.

Solution.

Problem 3. (15 points) Section 13.3, Exercise 13.12. Explain.

Solution.

Problem 4. $(15 + 15 = 30$ points) Section 14.2, Exercise 14.10. *Explain* your steps carefully.

For (a), study carefully how the example in Section 14.2 is solved using generating functions, and solve it in a similar way. (Be reminded that a "closed form" means a rational function that does not use a power series.)

For (b), do the partial fraction decomposition of $H(z)$ and expand it into a sum of two power series and then combine them into a power series to find the coefficient for the z^k power term (like we did for the Fibonacci recurrence in the problem solving video and in the lecture notes).

Solution.
(a)

(b)

Problem 5. (15 points) Section 14.7, Exercise 14.30. Study Example 14.14 in Section 14.7 and solve this exercise problem in a very similar way. Also, *explain* in a similar way as in Example 14.14.

Solution.

Problem 6. (15 points) Section 14.7, Exercise 14.32. Study Example 14.15 in Section 14.7 and solve this exercise problem in a very similar way. Also, *explain* in a similar way as in Example 14.15.

Solution.