CSCE 222 Discrete Structures for Computing – Fall 2023
Hyunyoung Lee

Problem Set 1

Due dates: Electronic submission of *yourLastName-yourFirstName-hw1.tex* and *yourLastName-yourFirstName-hw1.pdf* files of this homework is due on **Tuesday, 9/5/2023 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.**

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 prepare this homework.

Electronic signature: Kevin Lei

Total 100 points.

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. (10 + 10 = 20 points) Section 1.1, Exercise 1.3. For (b), give the knight's graph in a text format by giving all edges in the graph such that the knight's move from vertex v_i to vertex v_{i+1} is given as (v_i, v_{i+1}). Once you have all of the edges written, you can also give the path in the form of $v_i - v_{i+1} - v_{i+2} - \ldots$

Use the common convention of expressing the columns and rows of a chessboard as a, b, and c, and 1, 2, and 3, respectively.

Solution. Part (a). Put simply, there are not enough squares on a 3x3 chessboard that would allow a knight to make a full tour without revisiting at least one square.

Part (b). The knights graph of a 3x3 chessboard is the following: (a1,b3), (a1,c2), (a2,c1), (a2,c3), (a3,b1), (a3,c2), (b1,a3), (b1,c3), (b3,a1), (b3,c1), (c1,a2), (c1,b2), (c2,a1), (c2,a3), (c3,a2), (c3,b2). In in the form of $v_i - v_{i+1} - v_{i+2} - \ldots$, the knight's graph is

Problem 2. (2 points $\times$ 5 subproblems = 10 points) Section 2.1, Exercise 2.1

Solution.

Problem 3. (3 points × 5 subproblems = 15 points) Section 2.1, Exercise 2.3

Solution.

Problem 4. (2 points × 2 subproblems = 4 points) Section 2.2, Exercise 2.7 (a) and (b)

Solution.

Problem 5. (3 points × 2 subproblems = 6 points) Section 2.2, Exercise 2.8 (a) and (d)

Solution.

Problem 6. (15 points) Section 2.2, Exercise 2.18. Use a truth table to show your reasoning.

Example LaTeX source for how to draw a truth table is shown in the truth-table.tex and truth-table.pdf files.

Solution.

Problem 7. (10 points) Section 2.3, Exercise 2.25. Use a truth table.

Solution.

Problem 8. (20 points) Section 2.3, Exercise 2.26. Your answer should consist of a series of logical equivalences you learned in the text, and the final step must resolve to T. Do not use a truth table. Study the proofs of Proposition 2.8 (b) and (c) for the expected style of your answer. Watching the video "Problem Solving Exercise 1" in Module 2.1 will also be helpful.

Example LaTeX source for how to align the steps nicely is shown in the truth-table.tex and truth-table.pdf files.

Solution.