WRIGHT STATE UNIVERSITY
Department of Computer Science and Engineering
CS7200-01: Algorithm Design and Analysis
Summer 2017 Assignment 1 (100 pts)
Due: June 15, 2017 by 11:59pm

(50 pts)

1. Implement Gale-Shapley Algorithm for computing Stable Marriage Assignment in any language, such as ***Python, Java, C++ or MATLAB,*** using the approach and data structures described in the first two Chapters of the Kleinberg and Tardos text. The input file should include number of subjects, n, preference list for men and women one line for each.

$$n$$
$$m_1: w_{11}, w_{12}, \ldots, w_{1n}$$
$$\ldots$$
$$\ldots$$
$$m_n: w_{n1}, w_{n2}, \ldots, w_{nn}$$
$$w_1: m_{11}, m_{12}, \ldots, m_{1n}$$
$$\ldots$$
$$\ldots$$
$$w_n: m_{n1}, m_{n2}, \ldots, m_{nn}$$

   a) Write the output, explicitly checking to see that it is a stable match (It requires a separate function to check). Turn in sample inputs and corresponding outputs in separate files.

   b) Run the algorithm on several instances of the problem for n = 10 with different input files and plot the variation in the running time.

   c) Run the algorithm on several instances of the problem for n = 10 with the same input file and plot the variation in the running time.

   d) Run the algorithm on problem instances with n = 10, 15, 20, 50, 100, and plot the average running time as a function of the problem input size (n).

(20 pts)

2. Run Gale-Shapley Algorithm using the preference lists tables below. Are there any unstable pairs in the final match?

	1st	2nd	3rd
Xavier	Amy	Bertha	Clare
Yancey	Amy	Bertha	Clare
Zeus	Amy	Bertha	Clare

	1st	2nd	3rd
Amy	Xavier	Yancey	Zeus
Bertha	Xavier	Yancey	Zeus
Clare	Xavier	Yancey	Zeus

(10 pts)

3. Do Problem 8 (a) (b) in Chapter 1 on Pages 27-28 of the Kleinberg and Tardos text.

(10 pts)

4. Do Problem 3 in Chapter 2 on page 67 of the Kleinberg and Tardos text. Provide a "clear" explanation in each case.

(10 pts)

5. Do Problem 1 in Chapter 3 on page 107 of the Kleinberg and Tardos text. Look at solved exercise 1 on page 104 as an example.

You can write your answers for the questions 2 to 5 on paper, scan and create a pdf file for each question. Name each file using "Question-#.pdf" format.

TURNIN: Bundle your source code, sample inputs/results, timing plots and answers of each question as a single zip archive, name it using "lastname-firstname" format, and submit to DropBox on Pilot by the deadline.