

ALGORITHMS, DATA AND SECURITY A.Y. 2021/22
Midterm on April 8, 2022

Surname _____ Name _____
ID number _____

Question 1

- a) Consider the Gale-Shapley algorithm and perform it on the following set of men and women, choosing either a women stable marriage or a men stable marriage.

Men = {1, 2, 3, 4}

Women = {A, B, C, D}

Preference lists:

- 1: A C B D (i.e., the man 1 prefers the woman A to C to B to D)
- 2: C B A D
- 3: D B A C
- 4: C D B A

- A: 3 1 2 4
- B: 1 3 2 4
- C: 1 3 2 4
- D: 4 3 1 2

- b) How is the solution if you apply the other kind of stable marriage (i.e., men stable marriage rather than women stable marriage or vice versa)? Explain also why the two solutions differ.

Question 2

- a) Given the ratings shown in the following table, predict Mary's rating for Snatch, explaining the steps of the algorithm you apply.

	Sherlock Holmes	Frankestein Junior	Snatch	The Gentlemen	Meet the Parents
Tom	3	4	4	5	
Mary	5	5		3	4
Lucy	2		5	5	3
Ann		4	2	4	5

The cosine similarity values are as follows:

1.00000000	-0.8528029	0.8164966	0.08111071
-0.85280287	1.0000000	-0.6237783	-0.12105003
0.81649658	-0.6237783	1.0000000	-0.49669963
0.08111071	-0.1210500	-0.4966996	1.00000000

Question 3

- a) Consider a sorting algorithm of your choice between SelectionSort and MergeSort and apply it to sort the following list in non-decreasing order, describing the various steps of the algorithm application: 14, 9, 7, 8, 5, 12
- b) Which is the running time of the two sorting algorithms above? Which is the fastest sorting algorithm among those we have analysed and why?