Sample Exam 1A

Started: Sep 25 at 4:50pm

Quiz Instructions

Closed Book.
Follow **UF's honor code.**
Not allowed: collaborations, textbook, internet search, or phones.

Question 1 — 5 pts

Consider any instance of the Stable Matching Problem. There must be a stable matching containing a pair *(h,s)* such that hospital *h* is ranked first on the preference list of medical student *s* and *s* is ranked first on the preference list of *h*.

- ◯ True
- ◯ False

Question 2 — 5 pts

$\log(n^2)$ is in $O(\sqrt[3]{n})$.

- ◯ True
- ◯ False

Question 3 — 5 pts

If $f(n) \in O(g(n))$ and $g(n) \in \Omega(h(n))$, then $f(n) \in \Theta(h(n))$.

- ◯ True
- ◯ False

Question 4

5 pts

Consider the directed graph
$G = (V = \{a, b, c, d, e\}, E = \{(b, d), (c, a), (d, a), (e, b), (e, c)\})$.

How many topological orderings does G have?

Question 5

15 pts

Consider the following preference tables for four university hospitals and four medical students.

	1st	2nd	3rd	4th
UCSB	Jane	Kyle	Lena	Mary
UCSD	Kyle	Jane	Mary	Lena
UCSF	Jane	Kyle	Lena	Mary
UCLA	Kyle	Jane	Lena	Mary

	1st	2nd	3rd	4th
Jane	UCSD	UCSB	UCSF	UCLA
Kyle	UCSB	UCSD	UCLA	UCSF

Lena	UCSD	UCLA	UCSB	UCSF
Mary	UCSD	UCSB	UCLA	UCSF

(i) Which one of the following is a stable matching?:

[Select]

(ii) Which one of the following is NOT an unstable pair with respect to the matching (UCSB-Jane, UCSD-Lena, UCSF-Kyle, UCLA-Mary)? :

[Select]

(iii) Which of the following is the output of the Gale-Shapley algorithm? :

[Select]

Question 6

25 pts

You are invited to ***n*** weddings in different locations, each of which last multiple days. You can ***excuse*** yourself from a wedding if you are attending another that has conflicting (overlapping) dates. You wish to ***minimize the number of weddings that you attend, providing valid excuses***.

Example. If there are five weddings scheduled on July 1-5, July 6-10, July 11-14, July 4-6, July 8-12. While it is feasible to attend three weddings with no conflict, you can choose to attend the ***two*** weddings on July 4-6 and July 8-12 and excuse yourself from others, which is an optimum solution.

i) Prove that the following algorithm does ***not*** always give an optimum solution. At each iteration, pick a wedding (to attend) in conflict with the maximum number of unmarked weddings, and mark the picked wedding and all those in conflict with it. [*Hint: you can construct a counter example*

with five intervals. Clearly specify the optimum solution and the greedy solution for your construction.]

ii) Design/describe a greedy algorithm for solving this problem optimally.

iii) Prove the correctness of your algorithm.

iv) Analyze the running time of your algorithm.

v) Provide a pseudocode for your algorithm.

Edit View Insert Format Tools Table

12pt Paragraph

p 0 words

Not saved Submit Quiz