ℹ Exam Instruction

COMP4418 – Knowledge Representation and Reasoning

Mock Exam – Term 3 2024

INSTRUCTIONS:

1. *Marks available for each question are shown in the exam.*
2. *All questions May Be Attempted.*
3. *For Multiple Choice Questions, you should select the One Best Answer.*
4. *For Multiple Response Questions, you should select one or more alternatives.*
5. *Students are advised to read all examination questions before attempting to answer the questions.*
6. *Students have been reminded of the UNSW rules regarding Academic Integrity and Plagiarism, and the fit to sit policy, before starting the exam.*
7. *Your work will be saved periodically throughout the exam and will be submitted when the test ends provided you are connected to the internet. If you are not connected to the internet at the conclusion of the exam, please ask a supervisor to save your submission.*
8. *You must complete all your work within the exam time. There is no extra time. No late submissions will be accepted.*
9. *Students may bring a UNSW approved calculator to the examination if they wish.*

1 Non-Cooperative Game: Example

Consider the following normal-form game, which is parameterized by a value $\alpha \in \mathbb{R}$.

	x	y
a	3, 0	1, -1
b	α, $-\alpha$	3, 2

For which values of α is the outcome $(\alpha, -\alpha)$ Pareto-optimal?

- -3 ✔
- 3
- -1
- 1

For which value of α can the game **not** be solved by iterated strict dominance?

- 5
- -4
- 1 ✔
- -3

For which value of α is it the maximin strategy of the row player to play *a* with probability $\frac{1}{3}$?

- 0
- 4
- 1
- 2 ✔
- 3

For which value of α will the row player play *a* with probability $\frac{1}{2}$ in a Nash equilibrium?

- 3
- 5
- 1
- -1 ✔
- -3

2 Cooperative Game: Example

For weighted voting games (that are a representation of coalitional games), which of the following sentences is **not** true?

Select one alternative:

- The core can be non-empty.
- If a vetoer agent exists, the core is empty. ✔
- The representation of game has size that is polynomial in the number of agents.
- The Shapley value of an agent can be zero.
- The Banzhaf value of an agent can be zero.

3 One-One Matching SPDA

Under the **Student Proposing Deferred Acceptance (SPDA)** algorithm, for one-one matching, the last college to be matched is always matched to the student who has made the maximum number of proposals.

Select one alternative:

- False ✔
- True

4 Fair Allocation: Example

Consider the following fair allocation instance of indivisible items and additive valuations with $n = 4$ agents and $m = 10$ items.

	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}
Agent 1	10	9	8	1	1	1	1	1	1	1
Agent 2	0	1	2	15	10	0	1	1	2	1
Agent 3	0	0	1	1	1	5	6	7	8	9
Agent 4	1	1	0	0	0	5	6	7	8	9

(Select one or more alternatives) Identify which of the following combinations can be simultaneously satisfied by an allocation.

- Leximin Optimality and Pareto Optimality. ✔
- Maximizing Utilitarian Social Welfare and EF.
- MMS and EF. ✔
- Leximin Optimality and Maximizing Utilitarian Social Welfare.

5 Social Choice: Example

Consider the following approval profile.

$7 : \{a, b, c\}, \quad 5 : \{a, d\}, \quad 4 : \{b, e\}, \quad 3 : \{c, f\}, \quad 4 : \{d\}, \quad 3 : \{e\}, \quad 2 : \{f\}.$

What outcome is chosen by AV for k = 3?

- $\{c, d, e\}$
- $\{a, d, e\}$
- $\{b, c, d\}$
- $\{a, b, d\}$
- $\{a, b, c\}$ ✔
- $\{d, e, f\}$

What outcome is chosen by CCAV for k=3?

- $\{d, e, f\}$
- $\{c, d, e\}$ ✔
- $\{a, b, c\}$
- $\{a, b, d\}$
- $\{a, d, e\}$
- $\{b, c, d\}$

What outcome is chosen by PAV for k=3?

- $\{a, b, d\}$
- $\{a, b, c\}$
- $\{d, e, f\}$
- $\{a, d, e\}$
- $\{b, c, d\}$ ✔
- $\{c, d, e\}$

What outcome is chosen by Phragmen for k = 2? (Hint: it may be useful to know that 8/132 > 5/84.)

- $\{a, b\}$
- $\{a, e\}$ ✔
- $\{c, f\}$
- $\{d, e\}$
- $\{a, d\}$