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The University of New South Wales
Session 2, 2017

GSOE9210 Engineering Decisions

Sample mid-term test

Instructions:

- Time allowed: 1 hour
- Reading time: 5 minutes
- This examination paper has 9 pages
- Total number of questions: 19 (multiple choice)
- Total marks available: 30 (not all questions are of equal value)
- Allowed materials: UNSW approved calculator, pencil (2B), pen, ruler, UNSW approved dictionary.

  This exam is closed-book. No books, study notes, or other study materials may be used.
- Provided materials: graph paper (1 page)
- Answers should be marked in pencil (2B) on the accompanying multiple choice answer sheet
- The exam paper may not be retained by the candidate

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1. (*1 mark*) In a decision tree a leaf node represents:

   (a) a strategy

   (b) a condition

   (c) an outcome

   (d) a random variable

   (e) none of the above

2. (*2 marks*) A decision tree with n nodes has how many branches/edges:

   (a) $\frac{n}{2}$

   (b) $n!$

   (c) n

   (d) $n - 1$

   (e) none of the above

3. (*1 mark*) Which of the following decision rules will always eliminate (*i.e.*, will never select) weakly dominated strategies:

   (a) *MaxiMax*

   (b) *Maximin*

   (c) *miniMax Regret*

   (d) Laplace's

   (e) none of the above

Questions 4 to 8 refer to decision table below.

	s_1	s_2
A	v	3
B	1	4

4. (*1 mark*) Which is the full range of values of v for which the *MaxiMax* decision rule would choose A?

   (a) $v \geqslant 1$

   (b) $v \geqslant 3$

   (c) $v \geqslant 4$

   (d) for all values of v

   (e) for no value of v

5. (*1 mark*) Which is the maximum range of values of v for which the *Maximin* decision rule would choose A?

   (a) $v \geqslant 1$

   (b) $v \geqslant 3$

   (c) $v \geqslant 4$

   (d) for all values of v

   (e) for no value of v

6. (*1 mark*) What is the maximum range of values of v for which Laplace's decision rule would choose A?

   (a) $v \geqslant 1$

   (b) $v \geqslant 2$

   (c) $v \geqslant 3$

   (d) for all values of v

   (e) for no value of v

7. (*2 marks*) For which range of values of v below would Savage's *miniMax Regret* decision rule choose A?

   (a) $v \leqslant 1$

   (b) $1 \leqslant v \leqslant 2$

   (c) $v \geqslant 2$

   (d) for all values of v

   (e) for no value of v

8. (*1 mark*) For which range of values of v shown below would B be weakly dominated by A?

   (a) $v \leqslant 1$

   (b) $1 \leqslant v \leqslant 3$

   (c) $v \geqslant 4$

   (d) for all values of v

   (e) for no value of v

Questions 9 to 11 refer to decision table below.

	s_1	s_2
A	10	2
B	3	3

9. (*2 marks*) Suppose an agent was indifferent between A and B. What would be the value of the agent's optimism index α?

   (a) $\frac{1}{3}$

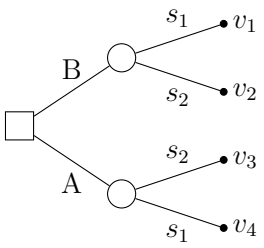
   (b) $\frac{2}{7}$

   (c) $\frac{3}{4}$

   (d) $\frac{1}{8}$

   (e) none of the above

10. (*2 marks*) For which values does the following tree best represent the table above:



(a) $v_1 = 3$, $v_2 = 10$, $v_3 = 3$, $v_4 = 2$

(b) $v_1 = 2$, $v_2 = 3$, $v_3 = 10$, $v_4 = 3$

(c) $v_1 = 10$, $v_2 = 3$, $v_3 = 2$, $v_4 = 3$

(d) $v_1 = 3$, $v_2 = 3$, $v_3 = 2$, $v_4 = 10$

(e) none of the above

11. (*2 marks*) Which action would be chosen under *miniMax Regret*?

(a) both A and B

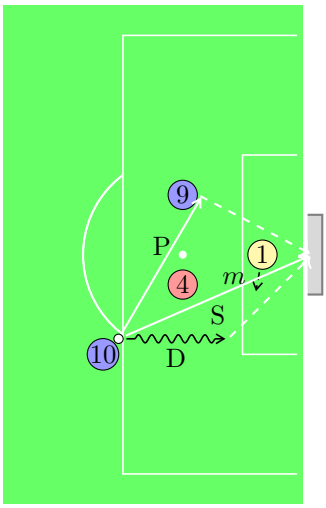
(b) neither A nor B

(c) A only

(d) B only

(e) none of the above

Questions 12 to 19 refer to the diagram below.



Alice plays football and finds herself in the situation shown above. Alice (blue #10), who has the ball, and a teammate (blue #9), are trying to score against an opposition defender (red #4) and goal-keeper (yellow #1). Suppose Alice has three actions to choose from:

P pass to her team-mate (blue #9) to shoot;

D dribble towards goal then shoot; or

S shoot from where she is.

Alice believes that her team's chances of scoring if she passes to her team-mate are 3 in 10. The chances of scoring if she dribbles toward goal before shooting are 5 in 10. Her chances of scoring by shooting from where she is are 2 in 10.

There is the possibility that the goal-keeper (yellow #1) might move (m) toward the ball as shown, in which case the chances of scoring by passing and shooting would improve respectively to 5, 3, and the chances of scoring if she dribbles would be reduced to 1.

12. (*1 mark*) Which, if any, pure actions above are strictly dominated?

    (a) P only
    (b) D only
    (c) S only
    (d) D and S
    (e) none of the above

13. (*1 mark*) Which is the *Maximin* pure action?

    (a) P only
    (b) D only
    (c) S only
    (d) D and S
    (e) none of the above

14. (*2 marks*) The *Maximin* mixed action is:

    (a) passing twice as often as dribbling
    (b) dribbling twice as often as passing
    (c) shooting twice as often as dribbling
    (d) passing as often as shooting
    (e) none of the above

15. (*2 marks*) Alice could guarantee that her chances of scoring were no worse than:

    (a) 1 in 10
    (b) 2 in 10
    (c) 3 in 10
    (d) 4 in 10
    (e) 5 in 10

16. (*2 marks*) Which mixtures of passing and dribbling would be at least as preferred as shooting in all possible states?

    (a) dribbling at least twice as often as passing

    (b) passing at least three times as often as dribbling

    (c) dribbling no more than three times as often as passing

    (d) passing at least as often as dribbling

    (e) none of the above

17. (*2 marks*) Which mixtures of passing and dribbling would be preferred under *Maximin* to the strategy "always shoot"?

    (a) dribbling at least twice as often as passing

    (b) passing at least three times as often as dribbling

    (c) dribbling no more than three times as often as passing

    (d) passing at least as often as dribbling

    (e) none of the above

    Let $p = P(m)$ be the probability that the goal-keeper will move as shown.

18. (*2 marks*) For what range of values of p would it be better for Alice to dribble than to shoot?

    (a) $p < \frac{2}{3}$

    (b) $p > \frac{3}{5}$

    (c) $p > \frac{2}{5}$

    (d) $p < \frac{3}{5}$

    (e) none of the above

19. (*2 marks*) Which percentage below gives the proportion of time which, if the goal-keeper were to move, would most restrict Alice's chances of scoring despite her best efforts?

    (a) 80%
    (b) 70%
    (c) 60%
    (d) 50%
    (e) 40%

End of exam

Total questions: 19
Total marks: 30