Take Test: COMP310 MOCK EXAM

Question Completion Status:

Description	MOCK EXAM COMP310 - Multi Agent Systems. Examiner: T. Carroll
Instructions	These questions are indicative of the sort of questions you will get on the real exam (though the marks allocation will be different). The method of delivery of this mock exam (via vital) is also what you should expect in the real exam. Calculators are permitted. Question 6 is a 0-mark **file response question**. You should use this to upload any additional files that you wish to be considered. You should make explicit reference to these files within your answer. This exam will not be marked, but I will review the answers in a session before the exam. Please use this as a practise, so that you are comfortable with the format of the vital exam.
Multiple Attempts	This Test allows multiple attempts.
Force Completion	This Test can be saved and resumed later.

QUESTION 1

15 points (Extra Credit) Save Answer

Consider the following environment $Env = \langle E, e_0, \tau \rangle$, defined as follows:

- $E = \{e_0, e_1, e_2, e_3, e_4, e_5\}$
- $\tau(e_0, \alpha_0) = \{e_1, e_2\}$
- $\tau(e_1, \alpha_1) = \{e_3\}$
- $\tau(e_2, \alpha_2) = \{e_4, e_5\}$

Within Env, there are placed 2 agents:

Click Save and Submit to save and submit. Click Save All Answers to save all answers.

- $Ag_2(e_0) = \alpha_0$
- $Ag_2(e_2) = \alpha_2$

Assume the probabilities of the various runs are as follows:

- $P(e_0 \xrightarrow{\alpha_0} e_1 \mid Ag_1, Env) = 0.5$
- $P(e_0 \xrightarrow{\alpha_0} e_2 \mid Ag_1, Env) = 0.5$
- $P(e_1 \xrightarrow{\alpha_1} e_3 \mid Ag_1, Env) = 1$

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- $P(e_0 \xrightarrow{\alpha_0} e_2 \mid Ag_2, Env) = 0.9$
- $P(e_2 \xrightarrow{\alpha_2} e_4 \mid Ag_2, Env) = 0.4$
- $P(e_2 \xrightarrow{\alpha_2} e_5 \mid Ag_2, Env) = 0.6$

Assume the utility function u is defined as follows:

- $u(e_0 \xrightarrow{\alpha_0} e_1) = 4$
- $u(e_1 \xrightarrow{\alpha_1} e_3) = 7$
- $u(e_2 \xrightarrow{\alpha_2} e_4) = 3$
- $u(e_0 \xrightarrow{\alpha_0} e_2) = 3$
- $u(e_2 \xrightarrow{\alpha_2} e_5) = 2$

a. Produce a graph of the possible runs for the two agents**. [5 marks]**

b. Which agent is optimal in Env?

You should explain your calculations when detailing how you reached your decision. **[10 marks]**

Total marks available for question: 15

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QUESTION 2

25 points (Extra Credit) Save Answer

The Blocksworld scenario is represented by an ontology with the following formulae:

- $On(x,y)$: obj x on top of obj y
- $OnTable(x)$: obj x is on the table
- $Clear(x)$: nothing is on top of obj x

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An agent has a set of actions Ac , such that $Ac = \{Stack, UnStack, Pickup, PutDown\}$:

$Stack(x,y)$

- $pre: Clear(y) \& Holding(x)$
- $del: Clear(y) \& Holding(x)$
- $add: ArmEmpty \& On(x,y)$

$UnStack(x,y)$

- $pre: On(x,y) \& Clear(x) \& ArmEmpty$
- $del: On(x,y) \& ArmEmpty$
- $add: Holding(x) \& Clear(y)$

$Pickup(x)$

- $pre: Clear(x) \& OnTable(x) \& ArmEmpty$
- $del: OnTable(x) \& ArmEmpty$
- $add: Holding(x)$

$PutDown(x)$

- $pre: Holding(x)$
- $del: Holding(x)$
- $add: OnTable(x) \& ArmEmpty \& Clear(x)$

Consider the following beliefs B_0 and the intention I_0:

Click Save and Submit to save and submit. Click Save All Answers to save all answers.

- $Clear(D)$
- $On(C,A)$
- $On(D,C)$
- $OnTable(A)$
- $OnTable(B)$
- $ArmEmpty$

Intention I_0:

- $Clear(C)$

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- $On(A,B)$
- $On(B,D)$
- $OnTable(D)$
- $ArmEmpty$

a. Calculate a plan π that would achieve I_0, given the beliefs B_0. Detail the current beliefs at the beginning of the plan, and after every action is performed. You should then verify that the intention I_0 is achieved with the final set of beliefs. **[15 marks]**

Consider the following set of beliefs B'_0, the following intention I'_0, and the plan π':

Beliefs B'_0:

- $On(B,D)$
- $Clear(B)$
- $On(C,A)$
- $On(D,C)$
- $OnTable(A)$
- $ArmEmpty$

Intention I'_0:

- $Clear(A)$
- $On(A,B)$
- $OnTable(B)$
- $Clear(D)$
- $On(D,C)$
- $OnTable(C)$
- $ArmEmpty$

$\pi' = \{unstack(D,C), putdown(D), unstack(C,A), putdown(C), stack(D,C), stack(A,B)\}$

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Total marks available for question: 25

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QUESTION 3

22 points (Extra Credit) Save Answer

In the context of cooperative games, consider the following marginal contribution net:

$a \wedge b \rightarrow 6$

$b \rightarrow 4$

$c \rightarrow 5$

$b \wedge \neg c \rightarrow 3$

Let v be the characteristic function that is defined by these rules. Give the values of the following, and justify your answer with respect to the rules:

a: $v(\{\emptyset\})$

b: $v(\{a\})$

c: $v(\{a,b\})$

d: $v(\{b,c\})$

e: $v(\{a,b,c\})$

[10 marks]

Consider the coalitional game with agents $\{a,b,c\}$. The charactersitic function is defined as:

$v(\{\emptyset\}) = 0$

$v(\{a\}) = 12$

$v(\{b\}) = 18$

$v(\{c\}) = 6$

$v(\{a,b\}) = 60$

$v(\{b,c\}) = 48$

Click Save and Submit to save and submit. Click Save All Answers to save all answers.

Calculate the shapley value for each agent a,b,c. You should show releveant steps in your working
[12 marks: 4 per agent]

Total marks for question: 22

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QUESTION 4

15 points (Extra Credit) Save Answer

a Give an example of a game that has **pure strategy nash equilibrium**, and justify why this is so. You may give the payoff matrix, or the utility function over the outcomes for each agent.
[5 marks]
b Give an example of a game that has **no pure strategy nash equilibrium**, and justify why this is so. You may give the payoff matrix, or the utility function over the outcomes for each agent.
[5 marks]
c For each of the games above, state (and justify) if there are any **pareto optimal outcomes**.
[5 marks]
Total marks for question: 15

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QUESTION 5

17 points (Extra Credit) Save Answer

Votes	3	2	5	3
First Choice	action	romance	comedy	drama
Second Choice	drama	drama	action	romance
Third Choice	comedy	comedy	drama	action

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b: Borda Count **[4 marks]**

c: Create a majority graph for the preferences **[5 marks]**

d**:** With justification, identify all **possible winners**.**[2 marks]**

e: With justification, identify any **condorcet winner [2 marks]**

Total for question: 17

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QUESTION 6

0 points Save Answer

File Response

Please use this question to upload any addition files you have used in your answer.

You should refer to these files in your relevant answer.

Attach File Browse My Computer

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