University College Dublin
An Coláiste Ollscoile, Baile Átha Cliath

SEMESTER I EXAMINATIONS

ACADEMIC YEAR 2018/2019

COMP 30240 & COMP 41400

Multi-Agent Systems

Prof. G.M.P. O

Time Allowed: 2 Hours

Instructions for Candidates

Answer any two questions. All questions carry equal marks
Total marks available 100.

Instructions for Invigilators

Q.1. (a) Explain the essence of Speech Act Theory and why this has been so influential within the development of Multi-Agent Systems (MAS).

[15 Marks]

(b) Cohen and Perrault postulated a plan-based theory of speech acts such that planning systems could reason about them. Adopting a STRIPS like notation define:

Request (S, H, α) where:

S represents the Speaker;
H represents the Hearer;
α represents the action being requested;

Clearly express the *preconditions* and *effect* of this *Request* speech act.

[15 Marks]

(c) Criti*gramming* with that of *a*

[20 Marks]

Q.2. (a) Compare and contrast the *reactive or situated action* agent architecture and that of the *intentional or deliberative* architecture.

Indicate the relative advantages and disadvantages of each.

[15 Marks]

(b) Describe in detail how intentions can form a basis for a practical reasoning system.

[15 Marks]

(c) Explain what is meant by the terms *Bold agent* and *Cautious agent.*

Characterise those environments that are most suitable to each.

[10 Marks]

(d) Reconsideration of intentions is costly. Assume the existence of a Boolean function deliberate which determines when to reconsider existing intentions.

Brie imality associated with invocation.

[10 Marks]

Q.3 (a) Explain in detail what is understood by the term *Belief Desire Intention Architecture (BDI)*.

[10 Marks]

(b) Explain and describe the specialisation of this abstract architecture which is incorporated into the AgentSpeak (L) agent programming language.

[10 Marks]

(c) Describe the core constructs provided within Agentspeak(L).

[20 Marks]

(d) Describe the core Agentspeak(L) interpreter cycle making reference to data structures that would need to be accessed.

[10 Marks]

Q.4. (a) Describe the *Prisoner's Dilemma*

[10 Marks]

(b) Explain the game-theoretic notation of a *payoff matrix* and utilise this to characterise the four possible outcomes associated with the dilemma. Explain each outcome.

[10 Marks]

(c) Utilise this payoff matrix to inform the action that a prisoner ought to adopt and clearly explain why they ought to adopt this strategy.

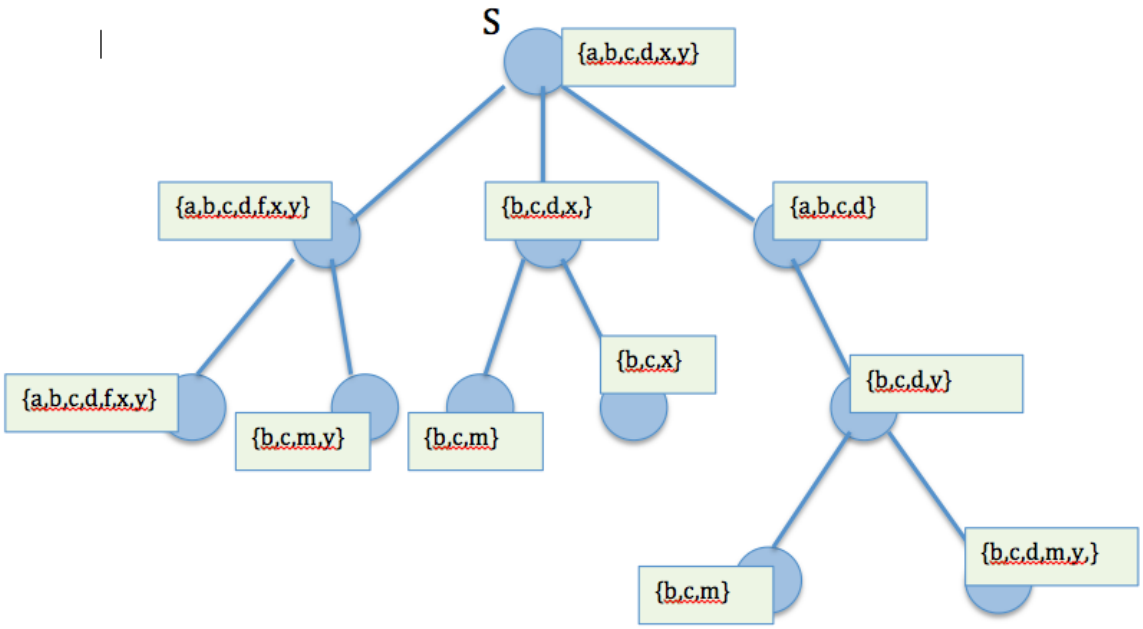
[10 Marks]

(d) Contrast *linear time temporal logic* and *branching time temporal logics*.

[10 Marks]

(e) Within the following tree assume n time. The arcs within the tree represent possible ch world state those concepts that are believed are depicted by the notation {x,v,g} indicating that x, v and g are all believed to be true within that particular future world state.

For State S express using branching time temporal logical formula(e) those relationship(s) that hold true at the states and paths contained within the diagram.



[10 Marks]