Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 1st Semester Examination – Sept. / Oct. 2015
CST 351-3 Artificial Intelligent Systems

Instructions to candidates:
Duration: 03 hours
Number of questions: Six (6)
Answer all questions
Mark allocation: 160

1.

a. Using an appropriate example, explain why 'Rationality' is concerned as the most influential aspect of 'Four Schools of Thoughts'.

(5 mark)

b. Discuss the evolution of Artificial Intelligence (AI) in past two centuries while emphasizing the key milestones.

(5 mark)

c. Explain how the 'Turing Test' can be adopted to evaluate modern intelligent systems.

(5 mark)

d. Discuss the influence of US Defence for the advancement of Artificial Intelligence (AI) via research.

(5 mark)

e. Discuss the social impacts of Artificial Intelligence in a context of 'Man-Machine Co-Existence'.

(5 mark)

2.

a. Why searching is important as a problem solving strategy?

(5 mark)

b. Evaluate the Breadth-First Search (BFS) and Depth-First Search (DFS) under the following criteria:

i. Completeness
ii. Optimality
iii. Time Complexity
iv. Space Complexity

(5 mark)

c.

i. Why DFS is better than BFS?

(2 mark)

ii. What is the major drawback of DFS?

(3 mark)

iii. Compare and contrast Depth Limited Search and Iterative Deepening Search (IDS).

(5 mark)

d. Using an appropriate state space (search tree), explain the best and worst scenarios of BFS, DFS, Depth Limited Search and Iterative Deepening Search (IDS).

(5 mark)

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3.

a.

i. What are the two major types of knowledge? Which category is more infuential for Artificial Intelligence?

(3 mark)

ii. What are the essential requirements of a typical Knowledge Representation (KR) system?

(2 mark)

iii. Compare and contrast the reasoning paradigms **Deductive reasoning** Vs. **Inductive reasoning**.

(4 mark)

b.

i. Distnguish a **proposition** with a **generic statement** (Non- Proposition).

(2 mark)

ii. Explain the terms 'tautology' and 'contradiction' using suitable examples.

(4 mark)

iii. Prove the validity of the following propositional logic expression using a truth table.
$(\mathbf{P} \vee \mathbf{Q}) \equiv (\neg \mathbf{P} \rightarrow \mathbf{Q})$

(3 mark)

c.

i. Explain the concept of forming a quantified sentence using 'quantifiers' using appropriate examples.

(4 mark)

ii. Express the following statements in predicate logic.
   a. All university undergraduates are smart.
   b. Among undergarduates, some intend to continue postgraduate studies.

(4 mark)

iii. Explain the quantified inference rules **Existential instantiation** and **Existential generalization** using appropriate examples.

(4 mark)

4.

a. List the key steps of a Genetic Algorithm (GA).

(6 mark)

b. What are the key genetic operations take place in a typical GA?

(4 mark)

c. Compare the two GA types **Generational GA** with **Steady-State GA.**

(6 mark)

d. Discuss the following issues occurr in **Fitness Proportionate Selection (FPS)**
   i. Pre-Mature Convergence
   ii. Stagnation

(4 mark)

e. Discuss the importance of the evolutionary computing using the real world applications of Genetic Algorithms.

(5 mark)

5.

a. i. What are the properties exhibited by any typical complex systems found in real orld context?

(5 mark)

ii. What is the 'Butterfly Effect'?

(3 mark)

b. Explain the concept "Intelligence as an emerging property of complexity" using an appropriate example.

(5 mark)

c.

i. Discuss the essential characteristics of a system comprised of Multi-Agents.

(5 mark)

ii. Define the term 'Rational Agent'.

(3 mark)

d. Discribe the Task Environment of an automated fire control robot using the parameters of PEAS.

i. Performance measure (P)
ii. Environment (E)
iii. Actuators (A)
iv. Sensors (S)

(4 mark)

6.

a. The following prolog rules are given.

```
parent_of(sahan,mala).
parent_of(shehani,mala).
parent_of(sahan,wimal).
parent_of(shehani,wimal).
child_of(X,Y):-parent_of(Y,X).
male(sahan).
male(wimal).
female(shehani).
female(mala).
```


Then write prolog clauses to define the following relationships.

i. mother_of(X,Y):-
ii. father_of(X,Y):-
iii. brother_of(X,Y):-
iv. spouse_of(X,Y):-
v. wife_of(X,Y):-

(2 x 5 = 10 mark)

b. Write short notes under the following topics.

i. Natural Language Processing
ii. Cognitive Science
iii. Emotional Intelligence
iv. Computer Vision
v. Emerging & Future trends of Artificial Intelligence

(4 x 5 = 20 mark)