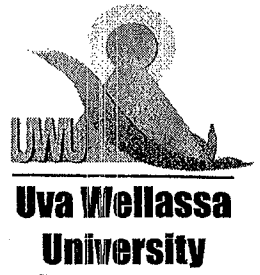


Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 1st Semester Examination – May/July 2017
CST351-3 Artificial Intelligent Systems



Instructions to candidates

Duration: Three (03) hours

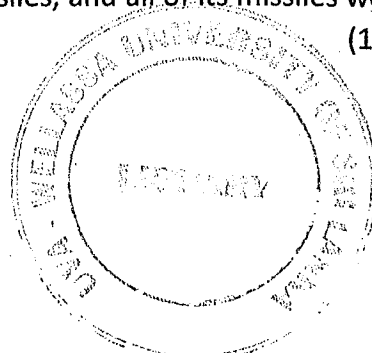
Number of questions: Six (06)

Answer all questions

Mark allocation: 120

1.
 - a. Depict structures of Goal-based and Utility-based agents. (10 mark)
 - b. Give examples to performance measure, environment, actuators and sensors of an intelligent taxi driver agent. (4 mark)
 - c. Differentiate the following environment types of intelligent agents.
 - i. Fully observable vs partially observable
 - ii. Static vs dynamic
 - iii. Episodic vs sequential(6 mark)
2.
 - a. Describe initial state, actions, transition model, goal test and path cost by considering an example. (5 mark)
 - b. Differentiate depth-limit and iterative deepening depth-first search? (5 mark)
 - c. Describe how to work bidirectional search? (5 mark)
 - d. Explain advantages of Greedy search algorithm compared with A* search algorithm using an example. (5 mark)
3.
 - a. Prove the implication elimination logical equivalence by a truth table of two (02) variables. (5 mark)
 - b. Giving all the steps, reduce the formula $(\neg p \rightarrow q) \rightarrow (q \rightarrow \neg r)$ to conjunctive normal form. (5 mark)
 - c. Draw a proof tree generated by forward chaining to the following paragraph for proving that Sirimal is a criminal.

The law says that it is a crime for a Sri Lankan to sell weapons to hostile nations. The country C1, an enemy of Sri Lanka, has some missiles, and all of its missiles were sold to C1 by Sirimal, who is a Sri Lankan. (10 mark)



4.

- a. Define inductive and deductive learning. (5 mark)
- b. Explain range finders, location sensors and proprioceptive sensors using examples. (6 mark)
- c. Compare reactive and subsumption control architectures using schematic diagrams. (9 mark)

5.

- a. Illustrate the basic structure of a rule-based expert system. (6 mark)
- b. Compare forward and backward chaining rule-based expert systems. (4 mark)
- c. Consider the following expert systems whose database consists of the facts A, B, C, D, E and whose knowledge base is given by the rules below. Show how backward chaining can be applied to this system to reach the conclusion Z.

Rule 1: IF A is true
AND C is true
THEN B is true

Rule 2: IF C is true
AND D is true
THEN F is true

Rule 3: IF C is true
AND D is true
AND E is true
THEN X is true

Rule 4: IF A is true
AND B is true
AND X is true
THEN Y is true

Rule 5: IF D is true
AND Y is true
THEN Z is true

(10 mark)

6.

- a. Assume that you have following prolog program. Draw derivation tree for predecessor(saman, amal) using the following program. (8 mark)

```
parent(amal, prasanna). %Fact 1
parent(nayana, amal). %Fact 2
parent(saman, nayana). %Fact 3
predecessor(X,Y) :- parent(X,Y). %Rule 1
predecessor(X,Y) :- parent(X,Z),predecessor(Z,Y). %Rule 2
```

- b. Write a prolog program to check whether the given element is a member of the given list or not. (6 mark)
- c. Define a predicate prodv(L1,L2,R) to multiply two (02) vectors L1 and L2. Then get the answer to the R.

Ex:

?- prodv([1,2,4],[3,2,3],R).

R = [3,4,12]

(6 mark)