

EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE 2001/2002
FIRST SEMESTER (April, 2002)
CS 304 - Artificial Intelligence

Answer All Questions

Time: 2 Hours

Q1

Briefly explain what is meant by state space.

Describe *Breadth-first search* procedures.

Consider the following *Water Jug* problem:

You are given two jugs, a 10-gallon one and a 6-gallon one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. The problem is to get exactly 8 gallons of water into 10-gallon jug.

- (i) Define the production rules used to create a problem state space.
- (ii) Draw the problem state space using breadth-first search technique with production rules.
- (iii) List the possible solutions of this problem from the problem state space tree defined by breadth-first search.

Q2

(a) Briefly describe *Hill Climbing* strategy.

(b) Briefly describe *Means-Ends Analysis* strategy.

Consider a simple household robot domain. Suppose that the robots in this domain were given the problem of moving a desk with one object on it from one place to another. The robot is instructed to move only one object at a time (either desk or the object on it).

Solve the above robot problem using means-ends analysis strategy. Show your steps clearly.

Q3

What are the five main components of most of the planning systems?

Describe the major principles involved in goal stack planning.

Show how goal stack planning may be used to solve the following simple blocks world stacking problem:

Initial state:

on(C, A), on(D, B), onTable(A), onTable(B)

Goal state:

on(B, A), on(C, D), onTable(A), onTable(D)

Q4

Describe the *resolution prove procedure*.

Consider the following five propositional axioms:

$$p \rightarrow q, \quad \neg q, \quad \neg p \rightarrow r, \quad (r \vee s) \rightarrow r, \quad \text{and} \quad \neg s$$

Using resolution prove procedure, show that r is true.

Consider the following sentences:

- (a) Kanthan is a Cs302 student.
 - (b) Kanthan is an EUSL student.
 - (c) All Cs302 students are EUSL students.
 - (d) Kamalam is a lecturer.
 - (e) All Cs302 students either like Kamalam or hate her.
 - (f) Cs302 students boycott when they do not like lecturers.
 - (g) Kanthan boycotts Kamalam's lectures.
- (i) Translate these sentences into formulas in predicate logic.
- (ii) Prove that "Kanthan hates Kamalam" using backward chaining.
- (iii) Convert the above predicate logic formulas into clause form.
- (iv) Prove that "Kanthan hates Kamalam" using resolution.