EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2004/2005

FIRST SEMESTER (Jan./Feb., 2006)

CS 304 - ARTIFICIAL INTELLIGENCE

Answer all questions **Time allowed: Two hours**

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1. (a) What is meant by state space? Briefly explain.

   (b) Compare and contrast the **Breadth-first** and **Depth-first** search procedures.

   (c) Consider the following Water Jug problem:

   You are given two jugs, a 9-gallon one and a 5-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 3 gallons of water into 9-gallon jug.

   i. Using suitable state representation show how you would encode the initial state and the goal state.

   ii. Define the production rules used to create a problem state space.

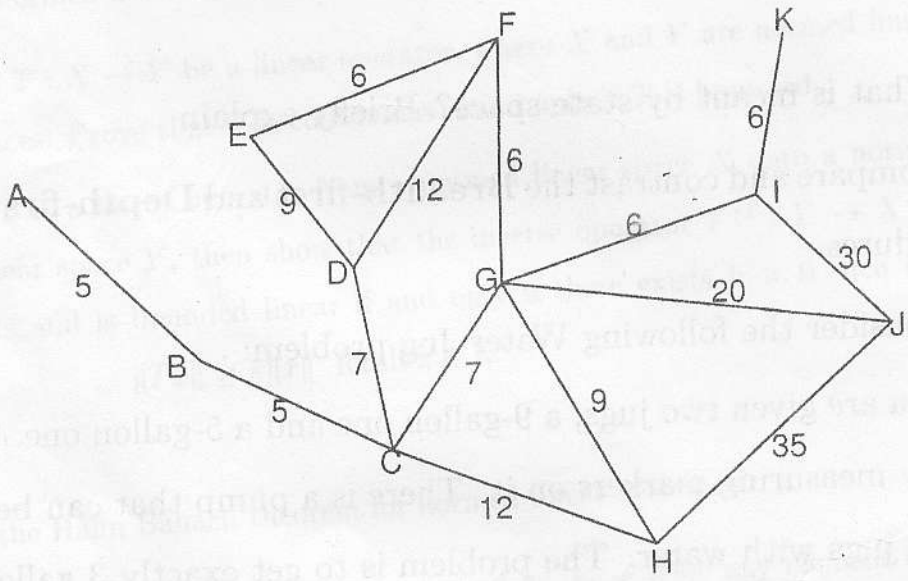
   iii. Write down a breadth-first search tree in order to find a solution to this problem.

   iv. List the possible solutions of this problem from the problem state space tree defined by breadth-first search.

2. (a) Give the algorithm for the **Steepest-Ascent Hill Climbing** strategy.

This algorithm may terminate not by finding a goal state but by getting to a state from which no better states can be generated. This will happen if the program has reached either a **local maxima**, a **plateau** or a **ridge**. Explain the bolded terms and give the ways to avoid these situations.

(b) Consider the following graph (not drawn to scale) with arc length shown on the arcs:



Suppose you have the following heuristics values for the distance to **A**:

h(A) = 0,	h(B) = 5,	h(C)= 6,
h(D) = 6,	h(E) = 9,	h(F) = 12,
h(G) = 14,	h(H) = 15,	h(I) = 17,
h(J)= 40,	h(K) = 15.	

Using A* search strategy to find a path from **E** to **A**.

3. (a) Describe the **resolution prove procedure.**

(b) Give the **unification** algorithm.

Trace this algorithm to the following two literals *mother-of (x, y)* and *motherf(Singgaram, Shanthiny)*

(c) Consider the following sentences:

(1) Suppan owns a dog.

(2) Every dog owner is an animal lover.

(3) No animal lover kills an animal.

(4) Either Suppan or Ponnan killed the cat, who is named Tuna.

i. Translate these sentences into formulas in predicate logic.

ii. Convert the above predicate logic formulas into clause form.

iii. Did Ponnan kill the cat?

4. (a) Describe the five main components of most of the planning systems.

(b) Express the STRIPS style operators **STACK, UNSTACK, PICKUP** and **PUTDOWN** in a more computation compatible form using clear definitions **P** (Precondition), **D** (Delete) and **A** (Add) and the predicates.

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

Initial state: on(A, B), on(B, C), onTable(C)

Goal state: on(C, B), on(B, A), onTable(A)