

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua  
Sidang Akademik 1992/93

April 1993

**CSI 503 - KNOWLEDGE BASED SYSTEMS**

Masa: [3 jam]

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**ARAHAN KEPADA CALON:**

- Sila pastikan bahawa kertas peperiksaan ini mengandungi **TIGA** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.
  - Jawab **SEMUA** soalan.
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Answer ALL Questions(There are FIVE Questions in total)

1. (a) Develop a breadth first search algorithm for a graph. Explain as to how it can be converted into a depth first and best first search algorithms. [8/20]
- (b) "In the best-first search method on graphs, if  $g$  is nonnegative, a cyclic path can never be better than the same path with the cycle omitted. Hence cycles can be prevented, if when a new path is generated to an existing node, that path were simply thrown away if it is no better than the existing recorded one."  
Discuss the above comment with reference to A\* algorithm. [6/20]
- (c) State an algorithm for searching an AND/OR graph and explain it with the help of an example. [6/20]
2. (a) Why does the search in game playing programs always proceed forward from the current position rather than backward from a goal state? [2/20]
- (b) In the mini-max procedure with alpha-beta cutoff does the ordering of the list of successor positions created by the move generator matter? Explain your answer with suitable examples. [6/20]
- (c) A game playing program is capable of evaluating 200,000 nodes/second. How many ply could the program look ahead in the allotted time of three minutes. Assume that (i) the effective branching ratio is 20, (ii) the time for comparison of the values is negligible and (iii) the program uses Mini-Max algorithm without alpha-beta cutoffs. [4/20]
- (d) A game is played as follows. Two players have in front of them a single pile of objects. The first player divides the original pile into two piles with unequal number of objects. Each player alternatively, thereafter, does the same to any one of the piles when it is his turn to play. The game proceeds until finally every pile has either just one object or two at which point continuation becomes impossible. The player who first cannot play is the loser.  
Define this as a state space search problem. Construct the search graph if the play was started with 7 objects and show by marking on the graph that the second player can always win. [8/20]

3. (a) Would conceptual dependency be a good way to represent the census details of a country? Explain your answer. [2/20]
- (b) Draw a frame system with inherited properties for a typical example. Develop the algorithm for the value inheritance and demonstrate it by simulating on your example. [10/20]
- (c) Artificial intelligence systems employ a variety of formalisms for representing knowledge and reasoning with it. Indicate the formalism that best facilitates the representation of the following sentences in order to answer the question that is posed. Explain your choice briefly. Show how the statements would be encoded in the formalism you have selected. Then show how the question could be answered.
- "When you go to a movie theatre, you usually buy a ticket, hand the ticket to the ticket taker, and then go and find a seat. Sometimes you buy popcorn before going to your seat. When the movie is over, you leave the theatre. Zool went to the movies."
- Question: Did Zool buy a ticket? [8/20]
4. (a) How do rules in Prolog differ from general Production System rules? [3/20]
- (b) What are the main advantages of keeping the knowledge base separate from the inference engine in knowledge based systems? [3/20]
- (c) Explain with the help of an example the inference process of a Rule Based Expert System. [8/20]
- (d) Discuss the knowledge acquisition phase of the Expert System life cycle. [6/20]
5. (a) Explain with examples as to how confidence factors are combined and computed by the VP Expert. Consider cases like conditions combined by OR, AND operations and a combination of both and multiple paths. [10/20]
- (b) Describe in detail the knowledge structures used by PC Plus to represent Knowledge bases. [10/20]