



KENYA METHODIST UNIVERSITY

END OF 2ND TRIMESTER 2010 EXAMINATIONS

SCHOOL : **SCIENCE & TECHNOLOGY**
DEPARTMENT : **COMPUTER SCIENCE AND BUSINESS INFORMATION**
UNIT CODE : **CISY 422/BBIT 221**
UNIT TITLE : **ARTIFICIAL INTELLIGENCE**
TIME : **2 HOURS**

Instructions: Attempt Question 1 and any other two questions.

Question 1 (30 Marks)

- (a) Briefly describe the Turing Test. (3 Marks)
- (b) Describe any four characteristics of intelligent agents. (2 Marks)
- (c) Describe an architecture of a simple reflex agent. (2 Marks)
- (d) Briefly describe how representation and learning is achieved in the following:
 - (i.) Decision tree (2 Marks)
 - (ii.) The perceptron (2 Marks)
- (e) Carefully explain how genetic algorithms work. (4 Marks)
- (f) Give any two genetic algorithm applications. (1 Mark)
- (g) Briefly describe natural language processing and give two important problems encountered in developing such a system. (4 Marks)
- (h) Represent the following facts in the language of predicate logic:
 - (i) Every apple is either green or yellow.
 - (ii) No apple is blue.
 - (iii) If an apple is green then it is tasty. (3 Marks)
- (i) Briefly describe the ways in which inferences can be drawn in an expert system. (3 Marks)
- (j) Give one advantage and one disadvantage of using the following knowledge representation methods:
 - (i) Frames (2 Marks)
 - (ii) Semantic Nets (2 Marks)

Question 2 (15 Marks)

(a) Search is important in artificial intelligence. Briefly describe a general search problem.

(2 Marks)

(b) Clearly explain the horizon problem for game tree search. (2 Marks)

(c) Games can be categorized as deterministic and non-deterministic. Carefully differentiate between deterministic and non-deterministic types of games.

(2 Marks)

(d) Below is a small dataset about credit risk on five individuals.

(i.) Identify the most important attribute. (4 Marks)

(ii.) Construct the entire decision tree. (4 Marks)

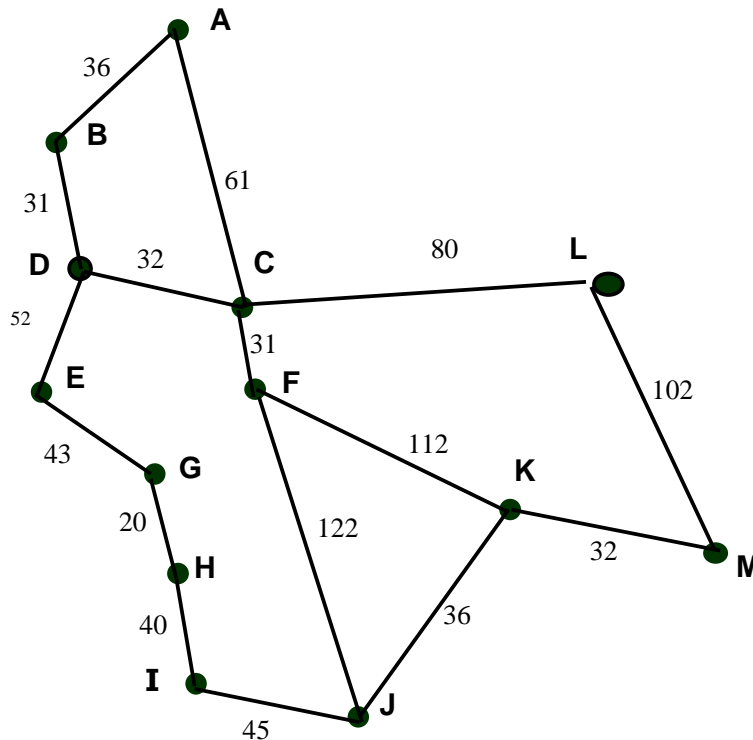
(iii.) Extract rules from your decision tree. (1 Marks)

No.	Debt	Income	Married	Risk
D1	High	High	Yes	Good
D2	Low	High	Yes	Good
D3	Low	High	No	Poor
D4	High	Low	Yes	Poor
D5	Low	Low	Yes	Poor

Question 3 (15 Marks)

(a) Explain the relationship between the A* algorithm and the Uniform Cost Search algorithm? (3 Marks)

(b) Consider the following map. (7 Marks)



Using the A* algorithm work out a route from town A to town M. Use the following cost functions.

- $g(n)$ = The cost of each move as the distance between each town (shown on map).
- $h(n)$ = The straight line distance between any town and town M. These distances are given in the table below.

Provide the search tree for your solution and indicate the order in which you expanded the nodes. Finally, state the route you would take and the cost of that route.

Straight Line Distance to M

A	223
B	222
C	166
D	192

E	165
F	136
G	122
H	111

I	100
J	60
K	32
L	102

M	0
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- (c) Breadth-First Search is both optimal and complete. Clearly explain what this means. (1 Mark)
- (d) Suggest any two ways artificial intelligence can be used by a lawyer in a busy law firm in Nairobi in her profession. Clearly articulate each. (4 Marks)

Question 4 (15 Marks)

- (a) For each of the truth tables below say whether it is possible for a perceptron to learn the required output. (6 Marks)

In each case, explain the reason behind your decision.

i)

Input	0	0	1	1
Input	0	1	0	1
Required Output	1	0	0	1

ii)

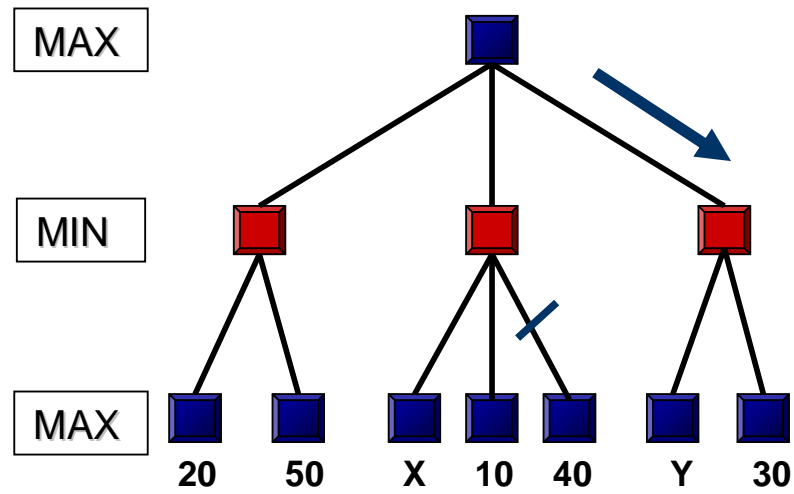
Input	0	0	1	1
Input	0	1	0	1
Required Output	1	1	0	0

iii)

Input	0	0	1	1
Input	0	1	0	1
Required Output	1	1	1	1

- (b) Explain why it might be a good idea to build a perceptron with a zero threshold figure. (2 Marks)

Consider the MINI-MAX game tree given below. One branch was pruned using alpha-beta pruning. The arrow indicates the first move. Find the values for X and Y.
(4 marks)



(c) Certain eye diseases are very common in Kenya, particularly in areas that are very dry and lack water. Suppose that you have been asked to create an expert system that could help health workers diagnose and suggest a course of treatment for these eye diseases. Explain any three ways you could adopt to acquire knowledge to build such a system.

(3 Marks)