KENYA METHODIST UNIVERSITY
FIRST TRIMESTER EXAMINATION
APRIL 2009

FACULTY	**:**	**ARTS & SCIENCES**
DEPARTMENT	**:**	**COMPUTER INFORMATION SYSTEMS**
COURSE CODE	**:**	**CISY 422**
COURSE TITLE	**:**	**ARTIFICIAL INTELLIGENCE**
TIME	**:**	**2HRS**

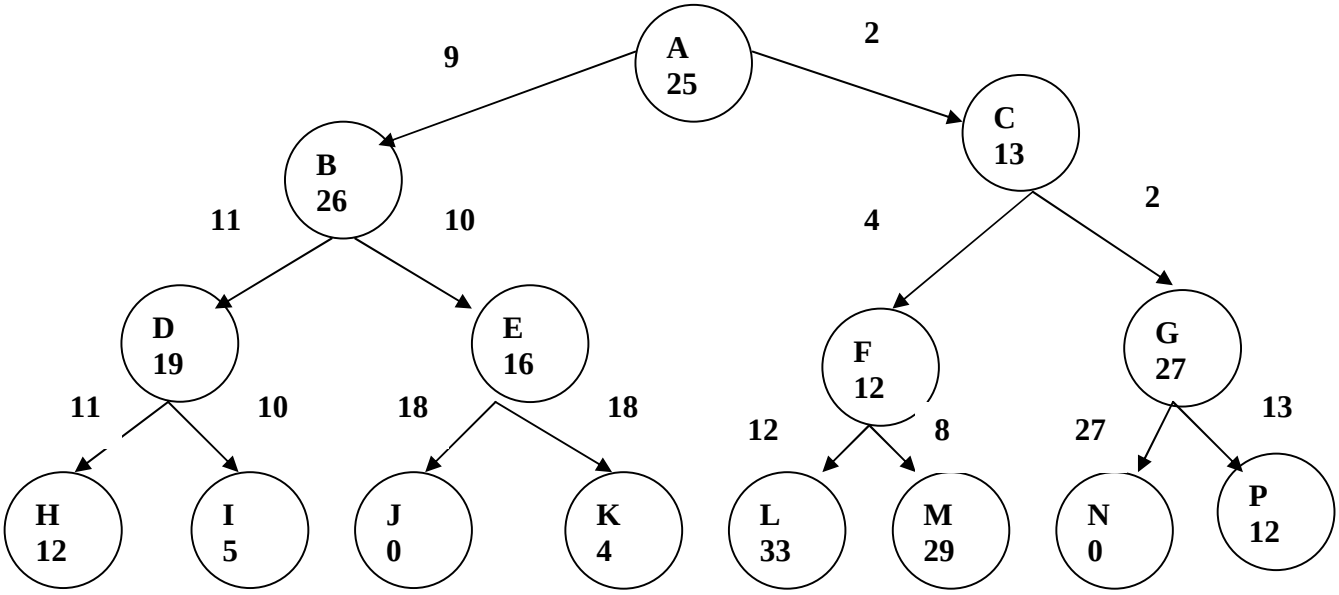
Instructions: Attempt Question 1 and any other two questions.

Question 1 (30 Marks)

a) List and briefly explain the four approaches used in defining Artificial Intelligence. [4]

b) Define the following terms [6]
   i. Knowledge based Systems
   ii. State space search
   iii. Rational Agent

c) A search tree is shown below where each circle represents a node corresponding to a state in search space. The estimated cost (h function) for finding a solution is shown in the circle. The two nodes with h=0 are goal states and the other terminal nodes are dead-ends. Actual link costs are marked on the links between the nodes. Thus the path cost (g function) of a node is equal to the sum of the link costs from the root to that node.



d) Using the following search algorithms, give the sequence of nodes expanded before a goal is reached:

i. Depth first [3]

ii. Breadth first [3]

e) Distinguish between propositional and predicate logic as knowledge representation formalisms. State one advantage and one limitation of each of these representation formalism. [4]

f) List and briefly describe the 5 properties of agent environments. [10]

Question 2 (15 Marks)

a) Use a truth a table to evaluate the following sentence. Is it valid? [5]

$(R \wedge Q) \rightarrow (P \vee Q) \wedge (P \wedge R)$

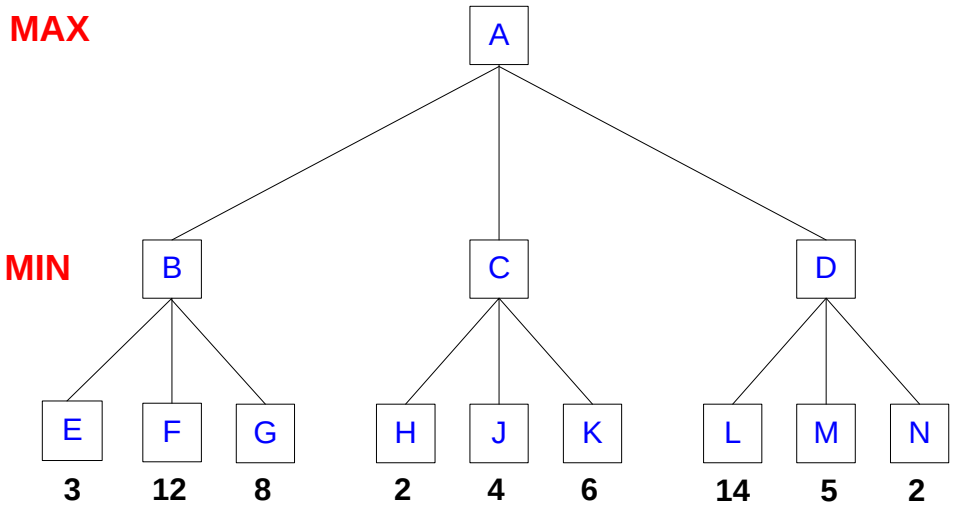
b) Draw the structure of an expert system and explain the function of each part [10]

Question 3 (15 Marks)

(a) Consider the MIN-MAX game tree given below. (To answer this question you will have to draw two neat sketches of the tree on your answer sheet).

(i)Perform alpha-beta pruning and illustrate this on your sketch. [3]

(ii) Calculate the difference in branching factor before and after pruning [2]



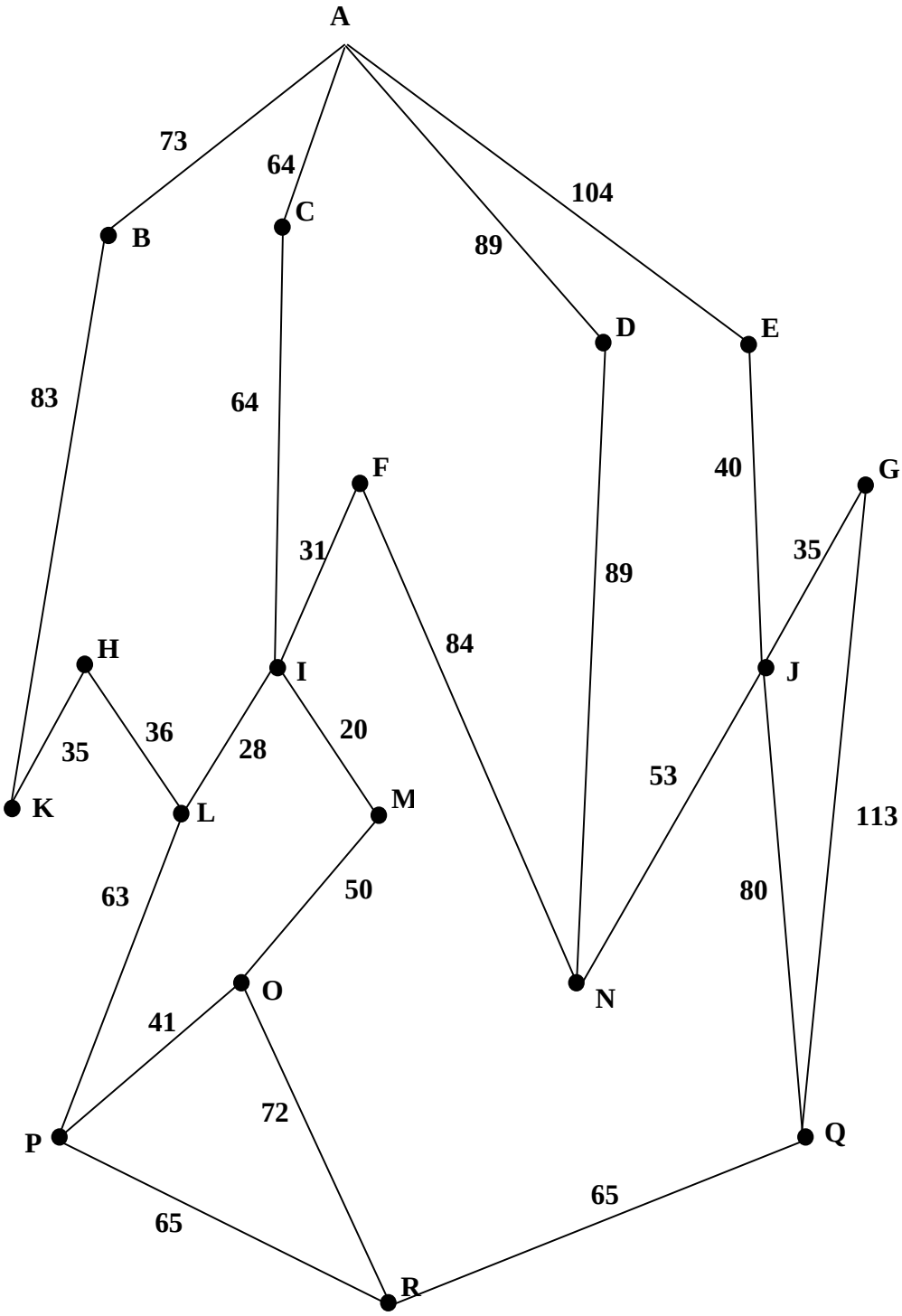
b) Represent the following sentences in predicate logic: [4]

i. Everybody loves somebody
ii. Nobody likes taxes

c) Explain the three difficulties encountered by hill-climbing algorithm. [6]

Question 4 (15 Marks)

a) Consider the map below *(not drawn to scale)*



Using the A* algorithm work out a route from A to R, using the following cost functions

g(n) = the distance between each town (shown on map)
h(n) = the straight line distance between any town and town R.

These distances are given in the table below as Straight Line Distance to R

A	240		**G**	165		**M**	100
B	186		**H**	139		**N**	77
C	182		**I**	120		**O**	72
D	163		**J**	130		**P**	65
E	170		**K**	122		**Q**	65
F	150		**L**	104		**R**	0

In your answer provide the following

(i) The search tree that is produced, showing the cost function at each node [10]

(ii) State the order in which the nodes were expanded and the route that is taken, and give the total cost [2]

(b) Describe how one-point crossover in genetic algorithms works. [2]

(c) Briefly describe any parent selection technique employed in genetic algorithms [1]