



KENYA METHODIST UNIVERSITY

END OF 1ST TRIMESTER 2010 (SCHOOL BASED) EXAMINATIONS

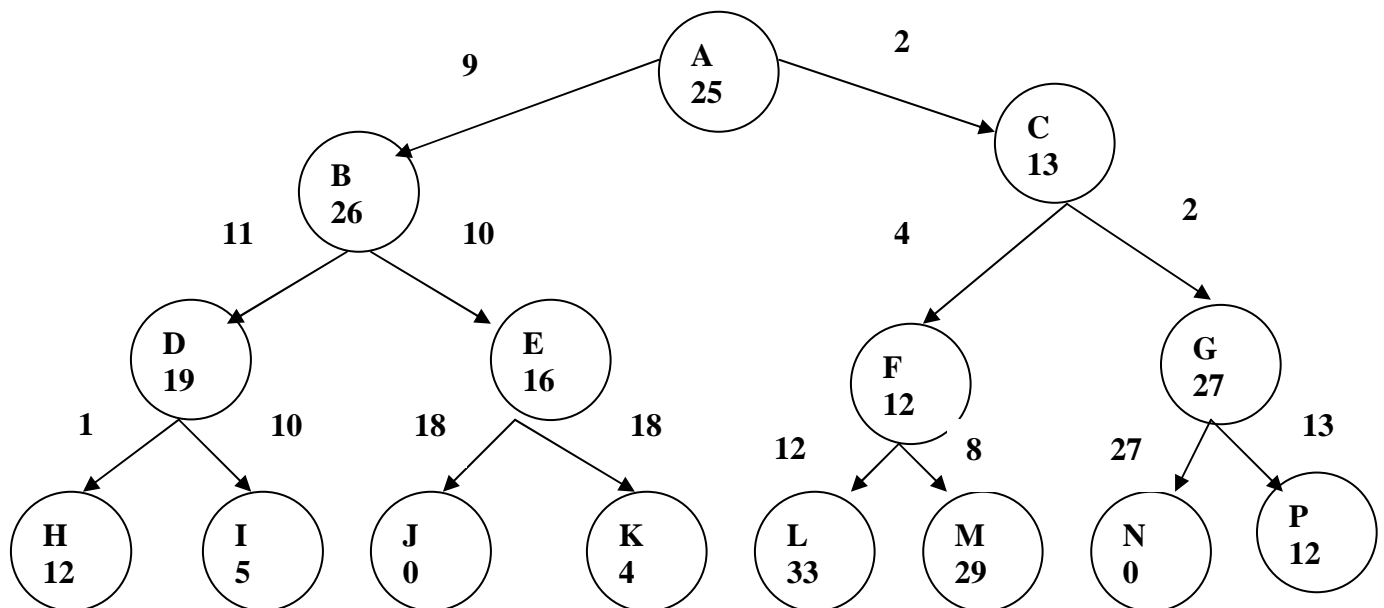
FACULTY : COMPUTING AND INFORMATICS
DEPARTMENT : COMPUTER INFORMATION SYSTEMS
UNIT CODE : COMP 440
UNIT TITLE : ARTIFICIAL INTELLIGENCE
TIME : 2 HOURS

Instructions:

- Attempt question 1 and any other 2 questions.

Question 1 (30 marks)

- a) List and explain the four approaches used in defining Artificial Intelligence. (4 mks)
- b) Define the terms: (6 mks)
- Knowledge based systems
 - State space search
 - 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 others 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.



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

- i) Depth first (3 mks)
- ii) Breadth first (3 mks)

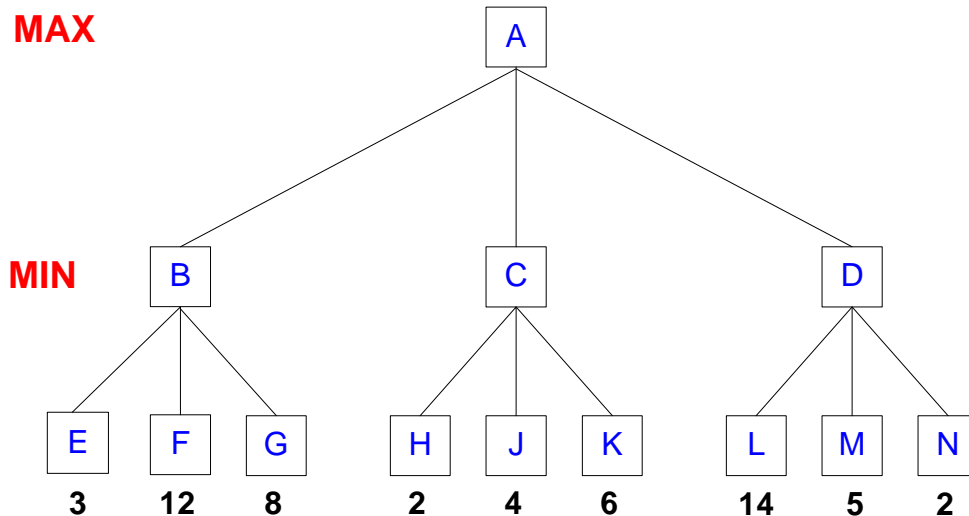
- d) Distinguish between propositional and predicate logic as knowledge representation formalism. State one advantage and one limitation of each of these representation formalism. (4 mks)
- e) List and briefly describe the 5 properties of agent environment. (10 mks)

Question 2 (15 marks)

- a) Use a truth table to evaluate the following sentence. Is it valid? (5 mks)
 $(R \wedge Q) \rightarrow (P \vee Q) \wedge (P \wedge R)$
- b) Draw the structure of an expert system and explain the function of each part. (10 mks)

Question 3 (15 Marks)

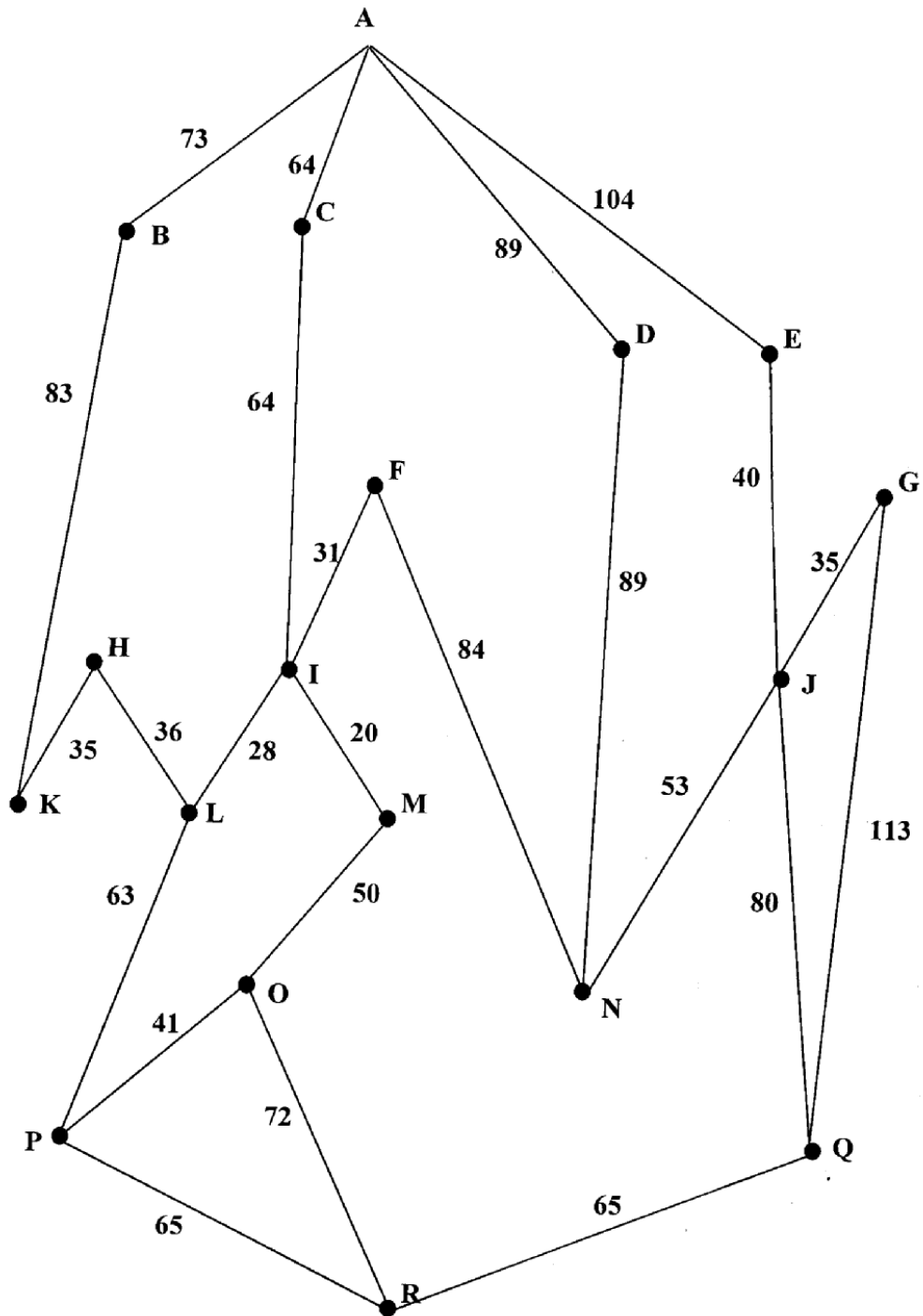
- (a) Consider the MIN-MAX game tree given below. (To answer this question you will have to draw two neat sketches of the tree on your answer sheet).
 - (i) Perform alpha-beta pruning and illustrate this on your sketch. (3 mks)
 - (ii) Calculate the difference in branching factor before and after pruning (2 mks)



- b) Represent the following sentences in predicate logic: (4 mks)
 - i. Everybody loves somebody
 - ii. Nobody likes taxes
- c) Explain the three difficulties encountered by hill-climbing algorithm. (6 mks)

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	440	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 mks)
 - ii) State the order in which the nodes are expanded and the route that is taken, and give the total cost. (2 mks)
- b) Describe how one-point crossover in genetic algorithms works. (2 mks)
- c) Briefly describe any parent selection technique employed in genetic algorithms. (1 mk)