



KENYA METHODIST UNIVERSITY

END OF 1ST TRIMESTER 2010 EXAMINATIONS

FACULTY : **COMPUTING AND INFORMATICS**
DEPARTMENT : **COMPUTER INFORMATION SYSTEMS**
UNIT CODE : **CISY 422/BBIT 221**
UNIT TITLE : **ARTIFICIAL INTELLIGENCE**
TIME : **2 HOURS**

Instructions:

- Answer question 1 and any other 2 questions.

Question 1 (30 marks)

- List and briefly explain the four approaches used in defining artificial intelligence. (4 mks)
- Define the following terms; (6 mks)
 - Knowledge based systems
 - State space search
 - Rational agent
- Distinguish between propositional and predicate logic as knowledge representation formalism. (4 mks)
- List and briefly describe the five properties of agent environments. (10 mks)
- Genetic algorithms (also sometimes called evolutionary computing) can be viewed as search strategies. How are genetic algorithms different from classical search strategies such as backtracking best first search and hill climbing? (2 mks)
- Describe Searle's Chinese room experiments. (4 mks)

Question 2 (20 marks)

- Explain state space search. (2 mks)
- Define the term heuristic as used in search problems. (2 mks)
- Consider the search problem presented by figure 1 with start state S and goal state G. use it to answer the questions (i) to (iii)
 - Draw a tree to show the state space on Figure. 1. (4 mks)
 - Show the order in which states will be expanded using depth first iterating deepening search and find the path cost. (6 mks)
 - Show the order in which states will be expanded using breadth first search and find the path cost. (6 mks)

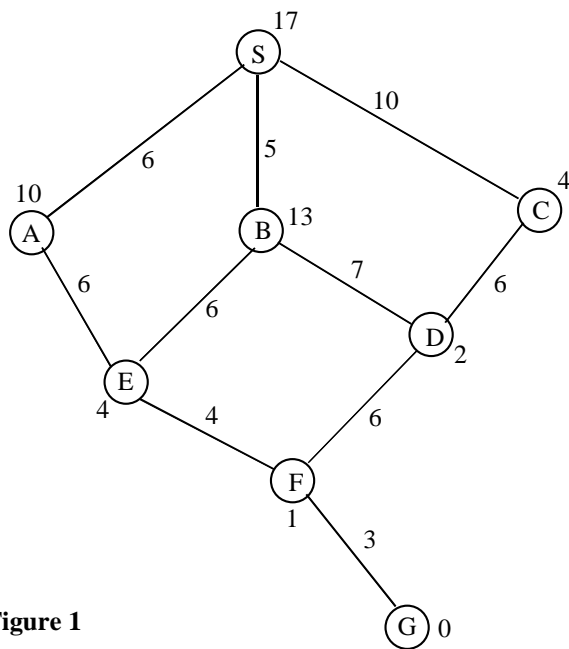


Figure 1

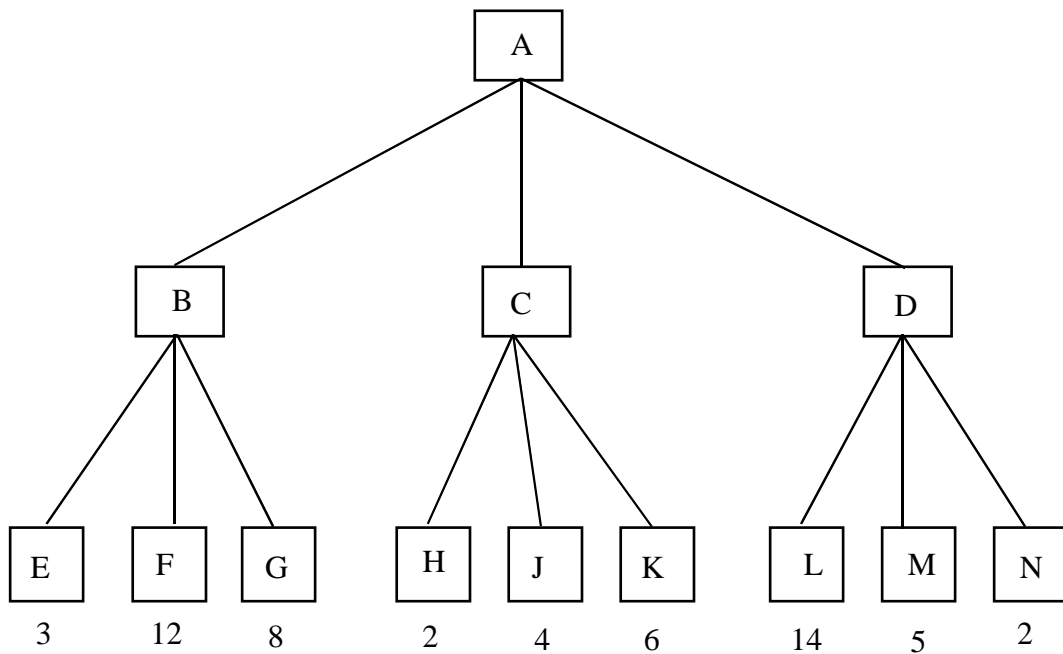
Question 3 (20 marks)

- a) Using suitable examples, describe the forward chaining and backward chaining inference control mechanism. (3 mks)
- b) One of the approaches to knowledge representation and inference is structured objects. Explain where these are used. (3 mks)
- c) Clearly explain the term unsupervised learning. (2 mks)
- d) A perceptron is used to learn a simple function. It has two regular inputs, x_1 and x_2 , and an extra fixed input x_0 which always has the value..... The perceptron output is such that if summation is greater than 0 then output is 1, else it is 0. Given the following training set with inputs (x_0, x_1, x_2) and target output T.

x_0	x_1	x_2	T
-1	1	1	1
-1	1	0	0
-1	0	1	0
-1	0	0	0

Show the change in the weights of the perceptron for every presentation of a training instance. The initial weights are randomly set as $w_1=0.2$, $w_2=0.3$ and $w_0=0.0$, the rate of learning η is 0.2. You should iterate over three epochs. Does the perceptron converge? (7 mks)

- e) Consider the min-max game tree given below;
 - 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)



Question 4 (20 marks)

- a) Give two examples of perceptual tasks which are carried out by human beings. (2 mks)
- b) What is meant by “first order predicate calculus” and what are its limitations? (6 mks)
- c) Express the following statements in F.O.L
 - i) “Every person is loved by some other person”
 Predicates: person (x), loves (x,y) (4 mks)
 - ii) “A bus took all the BBIT students to one of the stations in Nairobi”.
 Predicates: Bus (x), course (x), station (x), Nairobi (x), course_name (x,y), in (x,y)
 (4 mks)
 - iii) “All birds have at least two wings and exactly two legs”.
 Predicates: Bird (x), wing (x), leg (x), has (x,y) (4 mks)