# KENYATTA UNIVERSITY
## UNIVERSITY EXAMINATIONS 2011/2012
### SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
### SCT 208: ARTIFICIAL INTELLIGENCE

**DATE: FRIDAY 13ᵀᴴ APRIL 2012**          **TIME: 2.00 P.M. – 4.00 P.M.**

**INSTRUCTIONS**
**ANSWER QUESTION ONE AND ANY OTHER TWO**

**Question One (Compulsory)**

a) Justify the statement "Artificial intelligence is a multi-Disciplinary field". (4 Marks)

b) Explain two areas of applications of Artificial intelligence systems in the field of education. (4 Marks)

c) Use the four evaluation criteria for search algorithms to compare the Depth first and Bread first search algorithms. (4 Marks)

d) Using a relevant example explain how a problem should be defined in state space. (4 Marks)

e) Explain two inference mechanisms which can apply in a rule Based systems. (4 Marks)

f) Explain the term supervised learning in reference to Machine learning. Give a relevant example of a problem which can be solved through supervised learning. (4 Marks)

g) Using relevant examples explain how facts and rules are implemented in PROLOG database. (6 Marks)

**Question Two**
'An *agent* perceives it *environment* through *sensors* - which gives rise to *percepts*- and acts on the environment through *effectors*'.

a) Define the terms in italics in the above quotation and say how these terms apply when the agent is a security system. (8 marks)

b) Discuss the role of the agent's knowledge of the environment in the rationality of the agent. (4 marks)

c) Explain the concepts *programs with internal states* and *utility based agent* in the context of agents. (4 marks)

d) An agent's environment may be described as *episodic* and *discrete*. Describe these terms giving examples of agents and their environments. (4 marks)

## Question Three

a) Distinguish between informed and uninformed search strategies. (4 Marks)

b) Explain two real life applications of heuristic search techniques (4 Marks)

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.
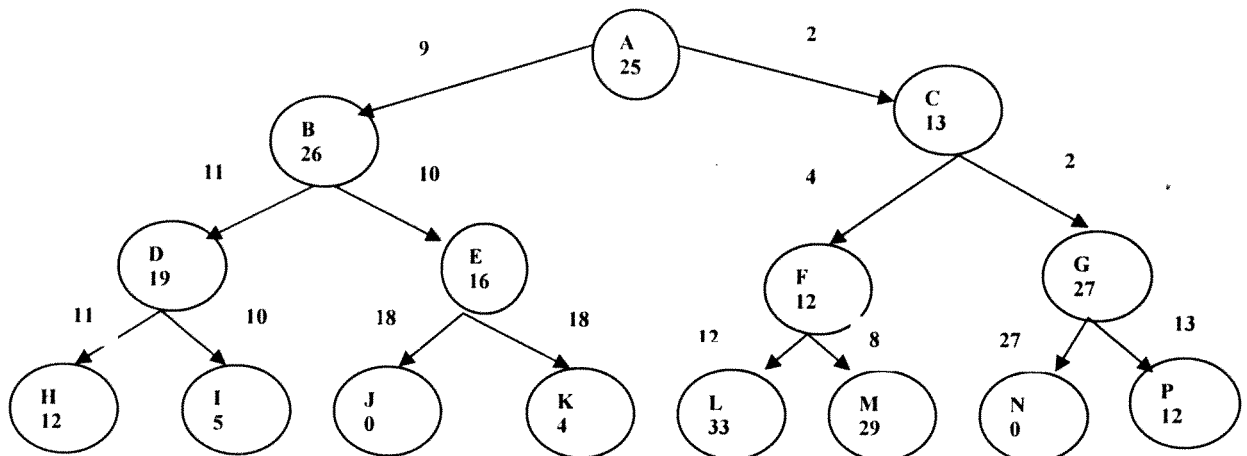


Using the following search algorithms, give the sequence of nodes expanded before a goal is reached:

    i.   Depth first (4 Marks)

    ii.   Breadth first (4 Marks)

    iii.   By using: $f(n) = g(n) + h(n)$ show how A* algorithm searches for the goal node. (4 Marks)

## Question Four

a) Differentiate between propositional logic and first order predicate logic (4 marks)

b) Represent the following sentences in first-order predicate logic. Give an appropriate interpretation.

    i.    Loki loves food. (2 marks)

    ii.    If spring break is rainy, Kim is sad. (2 marks)

    iii.    Some cats love food. (2 marks)

    iv.    All cats don't love dogs. (2 marks)

c) Explain four applications of expert systems (8 marks)

## Question Five

a) Semantic nets and frames are examples of knowledge representation schemes. Using a relevant example how each: represents knowledge, the advantage and disadvantage of each. (12 marks)

b) Let the following propositions be symbolized as follows:

A: interest rate falls
B: Bond prices increase
C: interest rate increases
D: Bond prices decline
E: interest rate unchanged
F: Bond prices remain unchanged
G: the shillings rising against other currencies
H: The shilling falls against other currencies
I: buy bonds

Let the following rules apply:

| | | | |
|---|---|---|---|
| R1: if A then B | R2: if C then D | R3: if E then F | R4: if G then A |
| R5: if H then C | R6: if D then I | | |

Explain how the backward chaining inference strategy can be used to advice your clients whether to buy bonds given one pays more shillings for other currencies (the shillings falls against other currencies) (8 marks)