KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

(ELECTRONIC AND COMPUTER ENGINEERING)

SCE 513: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

DATE: **Friday 26th November 2010** **TIME:** **2.00p.m -4.00p.m**

INSTRUCTIONS

(i) Answer Question 1 and any other two

(ii) Time 2 hours

Question One (Compulsory)

a) Define the following terms (6marks)

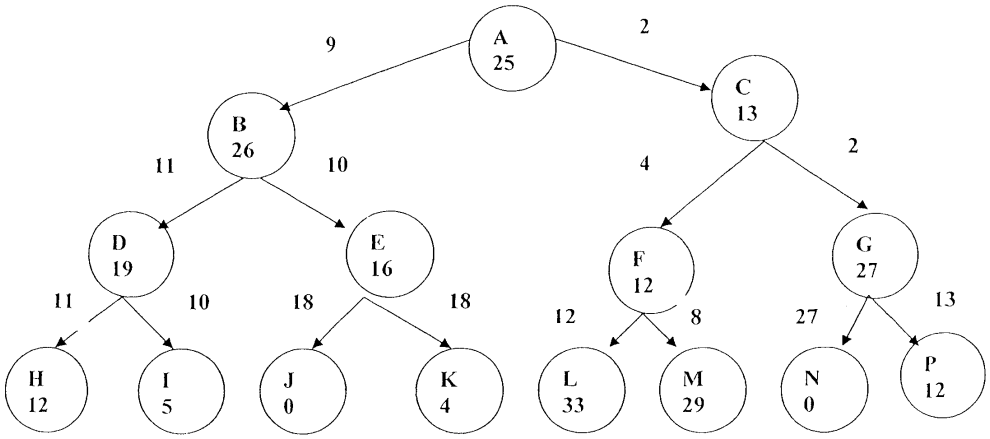
i. Knowledge based Systems

ii. State space search

iii. Rational Agent

b) Briefly explain the four approaches used in defining Artificial Intelligence (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.



d) Using the following search algorithms, give the sequence of nodes expanded before a goal is reached:
   i. Depth first (2 Marks)
   ii. Breadth first (2 Marks)
   iii. Greedy search (3 Marks)
   iv. A* algorithm (3 Marks)

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

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

Question Two

a) Use a truth a table to evaluate the following sentence. Is it valid? (6 Marks)
$(R \wedge Q) \rightarrow (P \vee Q) \wedge (P \wedge R)$

b) Represent the following sentences in predicate logic: (4 Marks)
   i. Everybody loves somebody
   ii. Nobody likes taxes

c) Draw the structure of an expert system and explain the function of each part (10 Marks)

Question Three

a) Explain the difference between Goal based agents and utility based Agents.(4 Marks)

b) Explain the three difficulties encountered by hill-climbing algorithm. (6 Marks)

c) Using a suitable example explain how frames can be used to represent Knowledge. State one advantage and one limitation for these representation formalism. (6 Marks)

d) Using a suitable example, describe the forward chaining and backward chaining inference control mechanisms. (4marks)

Question Four

a) Explain three types of knowledge which can be included in an expert systems. (6 Marks)

b) Explain any four characteristics of an Intelligent Agent. (4 Marks)

c) Justify the following statement. "Artificial Intelligence is Multi-disciplinary".(4 Marks)

d) With a relevant example explain how a search problem is specified. (6 Marks)

Question Five

Discuss the following Artificial intelligence fields highlighting the main activities, challenges and potential applications: (20marks)

i. Machine Learning
ii. Machine Vision
iii. Natural Language Processing and Understanding
iv. Pattern Recognition