



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

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AUGUST – DECEMBER 2018 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

REGULAR PROGRAMME

CMT 208: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Date: DECEMBER 2018

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

- Q1. a) Define the following terms
- i) Artificial Intelligence [2 marks]
 - ii) Agent [2 marks]
 - iii) Turing Test [2 marks]
 - iv) Percept Sequence [2 marks]
 - v) Rational Agent [2 marks]
- b) Rationality at any given point depends on **four** things, what are these four things? [4 marks]
- c) Giving examples, distinguish between a fully observable and partially observable Task Environment. [6Marks]
- d) What the **four** kinds of intelligent agents [4 Marks]
- e) A well define problem is broken down into **Four** components, what are those components [2 marks]
- f) The performance of a search algorithm is measured by **four** ways, identify

and explain briefly explain these four ways. **[4 marks]**

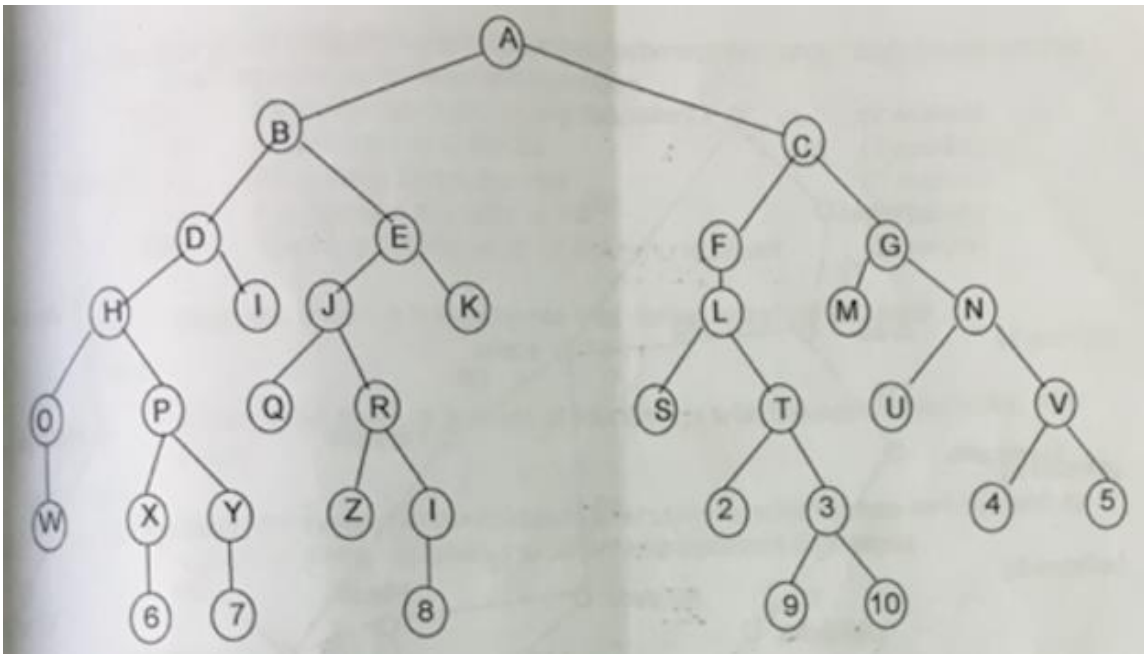
Q2. a) Using an appropriate illustration, describe the Breadth first search. **[4 marks]**

b) A task environment is a set of four things with the acronyms PEAS. List them. **[4 marks]**

c) Consider the state space below. Initial state is node A and goal state is node 10. Show the order of nodes, as they are visited using.

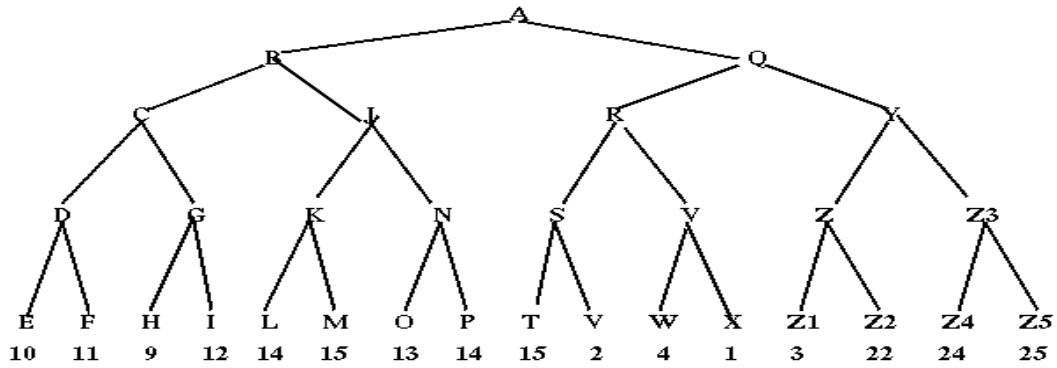
i) Breadth first search **[6 Marks]**

ii) Depth first search **[6 Marks]**

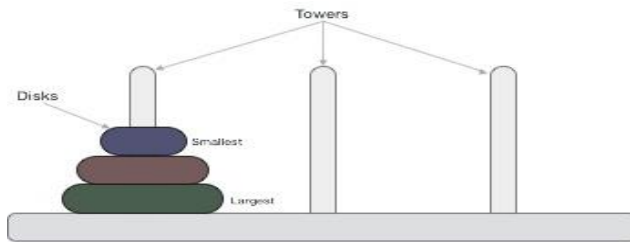


Q3. a) Describe semantic networks in reasoning systems **[2 marks]**

b) Apply minimax with Alpha-beta pruning on the following game tree



- i) Cross out the leaf nodes and/or branches where alpha-beta prunes. **[8 marks]**
- ii) Indicate the branch node values that are evaluated. **[2 marks]**
- c) Consider the Towers of Hanoi Puzzle. It consists of a collection of rings of different sizes and three posts mounted on a base. At the beginning all the rings are on the leftmost post as shown below and the goal is to move them all to the rightmost post by moving one ring at a time from one post to another. But at no time may a larger ring be placed on top of a smaller one. Find the solution using a search tree. **[10 Marks]**



- Q4. a) Consider the missionaries and cannibals problem. Three missionaries and three cannibals must cross a river using a boat, which can carry at most two people, under the constraint that for both banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals (if they were, the cannibals would eat the missionaries). The boat cannot cross the river by itself with no people on board. How can the boat be used to safely carry all the missionaries and cannibals across the river? Use state space search to find solution. **[10 Marks]**
- b) Suppose we are working with the following knowledge base:
 Wizard (ron)
 hasWand(harry)
 quidditch player(harry)
 Wizard(X):-hasBroom(X), hasWand(X).

hasBroom(X):- quidditchplayer(X).

How does prolog respond to the following queries?

- i) Wizard(ron).
- ii) Witch(ron).
- iii) Wizard(hermione).
- iv) Witch(hermione).
- v) Wizard(harry).
- vi) Wizard(Y).
- vii) Witch(Y).
- viii) quidditchPlayer(harry).

Q5. Consider an interactive English tutor agent

- a) Develop a description of the task environment using the PEAS description. **[4 marks]**
- b) Describe the environment according to the following properties: fully vs partially observable, deterministic vs stochastic, episodic vs sequential, static vs dynamic, discrete vs continuous, single vs multi-agent **[6 marks]**
- c) Suggest the most appropriate agent design by choosing the most appropriate of the following agent types: simple reflex agent, model-based reflex agent, goal-based agents, utility-based agent. **[2 marks]**
- d) Artificial intelligence is composed of a number of fields. Among them are:
 - i) Machine Learning
 - ii) Natural Language Processing
 - iii) Expert Systems
 - iv) Robotics
 - v) Computer Vision
 - vi) Neural Networks

Select one of the above fields and discuss it under the following headings

- i) The Concept **[3marks]**
- ii) Applications **[5 marks]**

END