UNIVERSITY EXAMINATION 2016/2017 YEAR III SEMESTER II YEAR IV SEMESTER II EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY AND BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

BIT 2319: ARTIFICIAL INTELLIGENCE

TIME: 2HRS

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<u>INSTRUCTIONS</u>

*Answer **Question One** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) There are many definitions attributed to artificial intelligence. In your own words clearly describe four approaches that have been used in attempting to define and understand artificial intelligence. (4mks)

b) Define machine learning giving at least two advantages. (4mks)

c) Explain two advantages and two disadvantages of artificial intelligence. (4mks)

d) Differentiate the following as used in artificial intelligence:

   (i)   Uniformed search Vs informed search (2mks)
   (ii)   Procedural Vs declarative knowledge (2mks)
   (iii)   Accessible Vs deterministic environment (2mks)

e) Why do we use AI to play games? Explain four reasons. (4mks)

f) Explain four factors which differentiate an agent from other computer systems. (4mks)

g) Describe four advantages of the "utility maximization" formulation. (4mks)

QUESTION TWO (20 MARKS)

a) The Turing test is believed to be first among many major researches that were used to demonstrate the ability of computers to exhibit some form of intelligence.

   (i)   Which category of the view of intelligence is the Turing Test? (1mks)

   (ii) Using a relevant diagram, briefly explain how the Turing test works. (4mks)

   (iii) Explain the capabilities a computer would need to pass the Turing test. (4mks)

   (iv) Is passing the Turing test a good scientific goal? (1mk)

b) Intelligent agents need to operate within a task environment. What do we use to specify the task environment?

c) Using the method identified in (b) above, specify the task environment for an agent of your choice. (4mks)

d) Explain the statement "what we can really achieve in AI is limited rationality" (2mks)

QUESTION THREE (20 MARKS)

a) Use the following facts to draw a semantic net: "Tom is a cat owned by John who is ginger in color, Tom caught a bird, Cats like cream, A cat is a mammal, A bird is an animal, All mammals have fur and are animals". (10mks)

b) Use a truth table to show that, the propositional logic $(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$ is valid. (5mks)

c) Translate the following into first-order logic (FOC) (5mks)

    (i) All the existing kinds of birds can fly.
    (ii) At least two existing kinds of birds can fly
    (iii) All red things on the table are small.
    (iv) All dogs are mammals
    (v) Every person has someone that they love.

QUESTION FOUR (20 MARKS)

a) Consider the game tree below
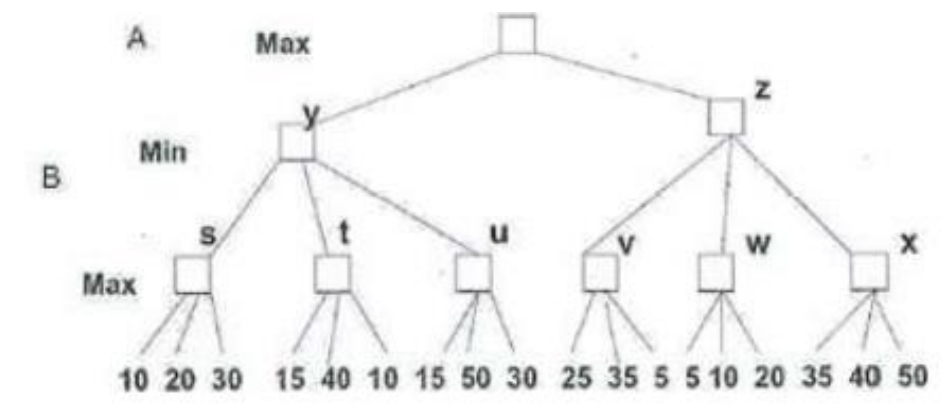
    (i)   Complete the tree by assigning values to the nodes S to Z (4mks)

    (ii)   What is the value of the root node? (1mk)

(iii)   Use minimax to determine the best strategy for both players, and give the actions that would be chosen. (2mks)

b) Consider the search tree below where each node represents a city. The goal node is G and links indicate legal transitions together with the associated cost for traversing each edge.
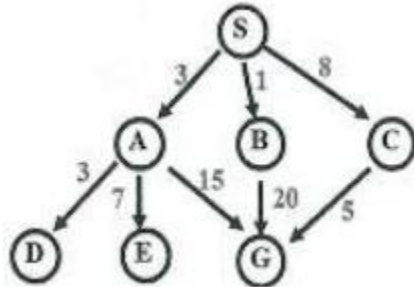
     (i.)   Formulate this as a search problem, specifying precisely all required components. (5mks)

     (ii.)   Identify and explain four dimensions used to evaluate search strategies. (4mks)

     (iii.)   Explain the procedure that would be used by breath-first and Depth-First search strategies giving the sequence of nodes expanded. (4mks)

QUESTION FIVE (20 MARKS)

a) Suppose you are a pilot with Kenya airways and you are tasked to fly a plane from JKIA to Eldoret airport. Define the action schema for this task.   (4mks)

b) Agents can be grouped into four classes based on their degree of perceived intelligence and capability: discuss   (8mks)

c) Consider the following set of training examples.

Instance	Classification	X_1	X_2
1	+	T	T
2	+	T	T
3	-	T	F
4	-	F	F
5	-	F	T
6	-	F	F

     (i.)   Describe three types of learning (3mks)
     (ii.)   What is the entropy of this collection of training examples with respect to the target function classification? Show your working. (2mks)

(iii.)   What is the information gain of X1 relative to these training examples? (3mks)