JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN COMPUTER SECURITY AND FORENSICS

3RD YEAR 2ND SEMESTER 2020/2021 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: IIT 3327

COURSE TITLE: ARTIFICIAL INTELLIGENCE

EXAM VENUE: **STREAM: BSC COMP. SECURITY**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

INSTRUCTIONS:

1. **Answer Question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE **[30 MARKS]**

a) Define the following as applies to Artificial Intelligence [6 Marks]
   (i) Genetic Algorithms
   (ii) Turing Test
   (iii) Iterative Deepening

b) Explain briefly the differences between: [8 Marks]
   (i) Modus Ponens and Modus Tollens
   (ii) Best-first Search and Means-end Analysis

c) The following statements might be TRUE or FALSE. For each case, provide reason to support your answer. [6 Marks]
   (i) Breadth-first search is a complete search procedure although depth-first search is not.
   (ii) If a tree search algorithm is complete, the corresponding graph search will be, too.
   (iii) The perceptron algorithm always converges for inseparable data.

d) Briefly explain how the Kohonen neural network is of both self-organization and competitive learning. [4 Marks]

e) Give the two tasks into which the natural language processing is divided into. [2 Marks]

f) Below are some statements expressed in English
   (i) John is a lawyer.
   (ii) Lawyers are rich.
   (iii) Rich people have big houses.
   (iv) Big houses are a lot of work to maintain.

   Express the above statements in first-order logic. [4 Marks]

QUESTION TWO **[20 MARKS]**

a) "Artificial intelligence can be understood by the eight definitions captured under four categories". Using an illustration, explain in support of this statement. [8 Marks]

b) Three missionaries and three cannibals are present at one side of the river and need to cross the river. There is only one boat available. At any point in time, the number of cannibals should not outnumber the number of the missionaries at that bank. It is also

known that only two persons can occupy the boat at available at a time. Aided by appropriate production rules, find the sequence of their transfer from one side of the river to the other using the boat sailing through the river satisfying these constraints.

[12 Marks]

QUESTION THREE **[20 MARKS]**

a) "The connectionist approach to Artificial Intelligence is quite different from the traditional symbolic approach". Discuss in support of this statement. [8 Marks]

b) Using a suitable example, briefly explain the goal stacking as a planning technique for solving compound goals. [8 Marks]

c) In computer vision, techniques for using stereo vision are in some ways similar to techniques for dealing with images of a fixed scene by a moving camera. What are the similarities and differences? [4 Marks]

QUESTION FOUR **[20 MARKS]**

a) "Fuzzy logic by itself does not exhibit intelligence. Invariably systems that use fuzzy logic augmented with techniques that facilitate learning and adaptation to the environment in question". Use a practical example to argue in support of this statement. [4 Marks]

b) Running from *You-Know-Who*, James enters the storey building on the 1st floor. He flips a fair coin: if it is heads he hides in room 135, otherwise he climbs to the second floor. In that case he flips the coin again, if it is heads he hides in guest room, otherwise he climbs to the third floor. In that case he flips the coin yet again, if it is heads he hides in 331, otherwise he hides in the Men's room. Determine the entropy of James's location. [6 Marks]

c) Consider a case where you want to design a neural network with sigmoid units to predict a person's academic role from his webpage. Possible roles are "professor", "student", "staff". However, each person can take any number (from 0 to all 3) of these roles at the same time. Briefly describe how you would represent the role label of a person in your training data, and also how to convert your neural network output (which will be real values because of the sigmoid units) to the roles. [6 Marks]

d) Explain four major problems facing current expert systems. [4 Marks]

QUESTION FIVE **[20 MARKS]**

a) Write a PROLOG program that can be you used output the goal: [6 Marks]

Who are Anne's cousins?

b) Explain the five major design issues in speech systems. [5 Marks]

c) Robotics have always been the final bed for testing intelligence. Empowering robots with the capability to think and decide what action to perform and when, has been tackled before. Using the theory of Artificial Immune System, demonstrate how a robots can be able to learn to perform their tasks autonomously. [9 Marks]

- **END -**