**CHUKA UNIVERSITY**

**EXAMINATION FOR MASTER OF SCIENCE IN COMPUTER SCIENCE Y1S1**

**COSC 841: ARTIFICIAL INTELLIGENCE**

**DATE:** **TIME: 3 HRS**

**INSTRUCTIONS:**

**Answer Question ONE and ANY other TWO Questions**

**Question One (30 Marks)**

a) Discuss the contributions of AI to the following concepts: **(6 marks)**
   i. Electronic commerce
   ii. Wearable technology
   iii. Internet of things(IOT)

b) AI is developing with such an incredible speed, sometimes it seems magical. There is an opinion among researchers and developers that AI could grow so immensely strong that it would be difficult for humans to control. Explain some of these threats citing examples. **(6 marks)**

**c)** What is the main difference between conventional computer programs and production systems (rule-based systems)? **(3 marks)**

d) Describe an algorithm to search a graph for a path or for a shortest path. **(4 marks)**

e) Consider the following rules.

Ru1e1: If **A** happens, then **C** can't have happened.
Rule2: Either **B** or **D** must have happened.
Rule3: **E** not happening implies that **B** also has not happened.
Rule4: If **D** has happened, then **G** has also happened.
Rule5: If **F** happens, then **A** also has happened.
Rule6: If **C** has not happened, then **E** can't have happened.

**Required**

(i) Represent the above knowledge using the appropriate AI logic. **(5 Marks)**

(ii) Assume **F** happens. Do we conclude **G** happened? Run;

(a) A forward chaining. **(3 Marks)**

(b) A backward chaining. **(3 Marks)**

**Question Two (15 Marks)**

a) What is a knowledge base, and how is it generated? **(3 marks)**

b) Differentiate between universal and Existential quantifiers in First order logic. **(4 Marks)**

c) Using semantic nets represent the following information. **(8 marks)**

*"Every human, animal and bird is living thing who breathe and eat. All birds can fly. All man and woman are humans who have two legs. Cat is an animal and has a fur. All animals have skin and can move. Giraffe is an animal who is tall and has long legs. Parrot is a bird and is green in color".*

**Question Three (15 Marks)**

a) Discuss three application areas of NLP. **(3 marks)**

b) Explain how the following algorithms operates:

   i. Hill climbing **(2 marks)**

   ii. Depth limited search **(2 marks)**

c) Using predicate logic represent the following information. **(8 marks)**

*"Every human, animal and bird is living thing who breathe and eat. All birds can fly. All man and woman are humans who have two legs. Cat is an animal and has a fur. All animals have skin and can move. Giraffe is an animal who is tall and has long legs. Parrot is a bird and is green in color".*

**Question Three (15 Marks)**

a) Discuss what is a goal state. **(2 marks)**

b) Using examples discuss the difference between natural intelligence and artificial intelligence. (**7 Marks)**

c) The inference rule of Logic provides the means to perform logical proofs or deductions. Using examples explain the meaning of the following rules.

   i. Modus Ponens **(2 Marks)**

   ii. Modus Tollens **(2 Marks)**

   iii. Universal elimination **(2 Marks)**

**Question Four (15 Marks)**

a) What is an Expert System? Discuss the components of an Expert System. **(5 Marks)**

b) Consider the task of designing an automated taxi driver, Describe its PEAS. (**5 Marks)**

c) Intelligent agents are software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, Explain the types of agents. **(5 Marks)**

**Question Five (15 Marks)**

a) Using an example explain how the inference engine works. **(2Marks)**

b) There are three missionaries and three cannibals on the left bank of a river. They wish to cross over to the right bank using a boat that can only carry two at a time. The number of

cannibals on either bank must never exceed the number of missionaries on the same bank, otherwise the missionaries will become the cannibals dinner!!.

i. Specify the representation of the states, operators, goal, start state and cost function. **(7Marks)**

ii. Plan a sequence of crossings that will take everyone safely across. **(6 Marks)**