CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE IN COMPUTER SCIENCE

COSC 845: EXPERT SYSTEMS AND KNOWLEDGE ENGINEERING

STREAMS: Y1S2 **TIME:3 HOURS**

DAY/DATE: FRIDAY 6/12/2019 **2.30 P.M – 5.30 P.M**

INSTRUCTIONS:

Answer all questions in section A and any two in section B

SECTION A (30 MARKS)
QUESTION ONE

1. Define the following terms as applied in expert system. (5 marks)
   a. Expert system
   b. Artificial intelligence
   c. goal state
   d. Heuristic
   e. inference engine
2. State four advantages of expert system. (4 marks)
3. With the aid of a diagram differentiate between breadth first search and depth first search as applied in expert system. (6 marks)
4. Explain six components of a typical expert system. (6 Marks)
5. Explain the term knowledge base as applied in expert system. (2 marks)
6. Explain case base reasoning. (3 marks)
7. Explain any four personnel involved in the development of an expert system.(4 marks)

SECTION B
QUESTION TWO(15 MARKS)

1. An expert system can, to a certain extent, act as a substitute for the expert from whom the knowledge was taken. Briefly explain the knowledge engineering process (6 marks)
2. State the functions of the following logical operators. (3 marks)
    a. ^
    b. ~
    c. ∃
3. Consider the following rule: "Every cow has horns".
    Further, assume the following facts.
    "Tony is a cow".
    "Tim has horns"
    "Jay has no horns"
    "Leli is not a cow".
    "Either Suzy is a cow or Suzy has horns"

Required: State whether the following conclusions are **True** or **False** according to the rules of propositional logic. (6 Marks)

(i) " Tony has horns"
(ii) "Tim is a cow"
(iii) "Jay is not a cow"
(iv) "Leli has no horns"
(v) "Suzy has horns"
(vi) "One can not have horns and fail to be a cow"

QUESTION THREE (15 marks)

1. Expert systems are designed to give expertise advice in various areas of applications. Describe the following areas showing the expertise that is being computerized.
    a. Medical diagnostic systems
    b. Weather forecasting systems (5 Marks)

2. 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

(a) Represent the above knowledge using the appropriate AI logic. (6 Marks)
(b) A ssume **F** happens. Do we conclude **G** happened? Run;
    (i) A forward chaining. (2 Marks)
    (ii) A backward chaining. (2 Marks)

QUESTION FOUR(15 MARKS)

1. Explain semantic nets as applied in expert system. (1 marks)

2. state four types of heuristic techniques as applied in expert system. (4 marks)
3. using sematic nets represent the following information. (10 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 FIVE (15 MARKS)

1. What is knowledge representation? (2 marks)
2. What is the work of the following in Prolog programming language? (4 Marks)
   a) .
   b) ;
   c) :-
   d) _
3. Using predicate logic represent the following information. (9 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".
