

CHUKA



UNIVERSITY

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UNIVERSITY EXAMINATIONS

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE AWARD OF  
BACHELOR OF SCIENCE COMPUTER SCIENCE / BACHELOR OF SCIENCE  
APPLIED COMPUTER SCIENCE**

**COSC 341: ARTIFICIAL INTELLIGENCE**

**STREAMS: BSC. COMPUTER SCIENCE / BSC (APPLIED COMP. SCI)**

**TIME: 2**

**HOURS**

**DAY/DATE: FRIDAY 12/4/2019**

**8.30 A.M. – 10. 30 A.M.**

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**INSTRUCTIONS:**

- Answer Question **ONE** and any other **TWO** questions.
- Diagrams should be used whenever they are relevant to support an answer.
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

**SECTION A**

**ANSWER ALL THE QUESTIONS IN THIS SECTION**

**QUESTION ONE [30 MARKS]**

- a) Describe the Turing Test in Artificial Intelligence [4 Marks]
- b) Giving one example for each, differentiate between supervised and unsupervised learning in Artificial Intelligence [4 Marks]
- c) List two advantages and two weakness of production rules as knowledge representation methods [4 Marks]

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- d) The following are some of the earlier implementations of Artificial Intelligence. Discuss each of them while indicating the contributions they have made to the world of Artificial Intelligence
- i. MYCIN [3 Marks]
  - ii. ELIZA [3 Marks]
- e) Highlight any one limitation of Artificial Intelligence [1 Mark]
- f) List any six behaviors considered intelligent behavior [6 Marks]
- g) You are given the following Prolog program. Translate the program into knowledge presented as an English paragraph [5 Marks]
- parent(victoria,albert).  
parent(X,Y):-father(X,Y).  
parent(X,Y):-mother(X,Y).  
father(john,henry).  
mother(jane,henry).

### SECTION B

#### ANSWER ANY TWO QUESTIONS FROM THIS SECTION

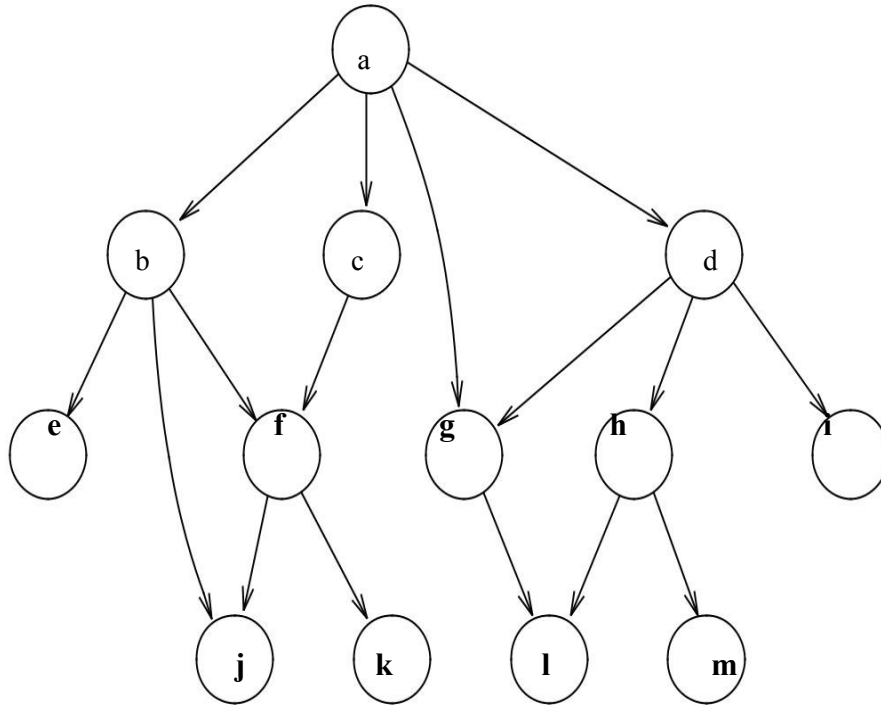
#### QUESTION TWO [20 MARKS]

- a) You are to develop an AI agent for a Self-Driving vehicle. Define a mapping for the agent that specifies the following (Goals, Percepts, Sensors, Effectors, Actions and Environment) [10 Marks]
- b) Making a computer that could play chess well was one of the early goals of Artificial Intelligence researchers. Computers can now play chess at grand master level, but it is not clear whether this involves intelligence. Discuss whether chess computers such as Deep Blue do, or do not, involve any intelligence, and whether creating chess computers contributes to our understanding of artificial intelligence. [10 Marks]

#### QUESTION THREE [20 MARKS]

- a) Mary, Ken and Florence are children of Joseph and Seraphina. Purity, Doreen and Mike are children of Mary. Annabel is the grandchild of Florence. Joyce is the wife of Ken.
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- i. Present this knowledge using Prolog [7 Marks]
  - ii. Who are the children of Joseph and Seraphina? Pose this as a prolog question [1 Mark]
  - iii. Someone is a grandchild of Joseph if their mother or father is a child of Joseph. Present this knowledge using Prolog. [2 Marks]

- b) Consider the following state space, where each node represents a state, and each directed link represents an operation.



Suppose the state space is to be searched, starting at node “a”. List the nodes of the state space in the order that they are expanded for each of the following search methods. Explain how the search algorithm operates.

- i. Depth First Search [3 Marks]
- ii. Breadth First Search [3 Marks]
- iii. Iterative Deepening Search [3 Marks]

- c) Explain the role of search in Artificial Intelligence [1 Mark]

**QUESTION FOUR [20 MARKS]**

Consider the following information

“In the animal world, carnivores such as lions and leopards hunt and eat herbivores such as zebras and wild beast. Thus some animals are hunters and some are hunted, and generally speaking carnivores hunt herbivores. However there are many exceptions to this rule. Elephants, which are herbivores, are rarely hunted because of their size. Nor are bears, which are not normally meat eaters and therefore basically herbivores. Bears will catch and eat other animals when opportunity arises.”

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- a) Represent the knowledge above using a semantic network [10 Marks]  
b) Describe three advantages of semantic networks [6 Marks]  
c) Describe two weaknesses of semantic networks [4 Marks]

### QUESTION FIVE [20 MARKS]

- a) Vision Systems is one of the branches of Artificial Intelligence. Highlight any three examples of real life useful implementations of vision systems [6 Marks]

- b) Identify and explain five differentiating factors between Tacit and Explicit knowledge [5 Marks]

- c) Consider the following investment decision-making given in symbolic form:

- A=100,000 Shillings
- B=Younger than 40 years of age
- C= Education at University level
- D= Annual income of at least 800,000 Shillings
- E=Invest at Treasury bills
- F=Invest at growth stocks
- G=Invest at NSE

The rules are given as follows: -

*R1: IF A AND C THEN E*

*R2: IF D AND C THEN F*

*R3: IF B AND E THEN F*

*R4: IF B THEN C*

*R5: IF F THEN G*

An investor has 100,000 Shillings and is younger than 40 years and wants an advice from an Expert System on whether to invest in NSE. Using backward chaining inference procedures advise the investor. [7 Marks]

- d) Giving an example, explain uncertainty reasoning by use of Certainty Factors [3 Marks]
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