



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (APPLIED PHYSICS AND TECHNOLOGY) AND

BACHELOR OF SCIENCE (MATHS AND COMPUTER SCIENCE)

SCO 113: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

DATE:

TIME:

INSTRUCTIONS: ANSWER QUESTION ONE AND OTHER TWO QUESTIONS

QUESTION ONE (30 Marks)

- a) Describe the following terms: (3 marks)
- i) Artificial intelligence
 - ii) Machine learning
 - iii) Natural language processing
- b) Discuss the Turing test for intelligence. (3 marks)
- c) Describe FOUR characteristics of an intelligent agent (8 marks)
- d) Discuss the application of AI in the following areas:
- i) Game playing (3 marks)
 - ii) Problem solving (3 marks)
- e) Represent the following natural language statements in predicate logic. (5 marks)
- i) Joseph is a student
 - ii) All dogs are mammals
 - iii) Every rectangle has four sides
 - iv) Some birds can fly
 - v) No cats are reptiles

- f) You wish to develop a system that is able to collect live news from around the world, sort and assign various journalists to follow up on the same.
- i) Explain the type of machine learning you can use to train the system. (3 marks)
 - ii) State two algorithms that fall in the category of f (i) above. (2 marks)

QUESTION TWO (20 MARKS)

- a) Explain FOUR areas where natural language processing has been applied. (8 marks)
- b) Discuss three steps of syntax analysis as used in natural language processing using a suitable example for each. (6 marks)
- c) Apply the below Inferencing system to answer the question that follow: (6 marks)

Rule 1: If patient has sore throat AND suspect a bacterial infection, Then patient has strep throat.

Rule 2: If patient temperature > 40 , Then patient has a fever.

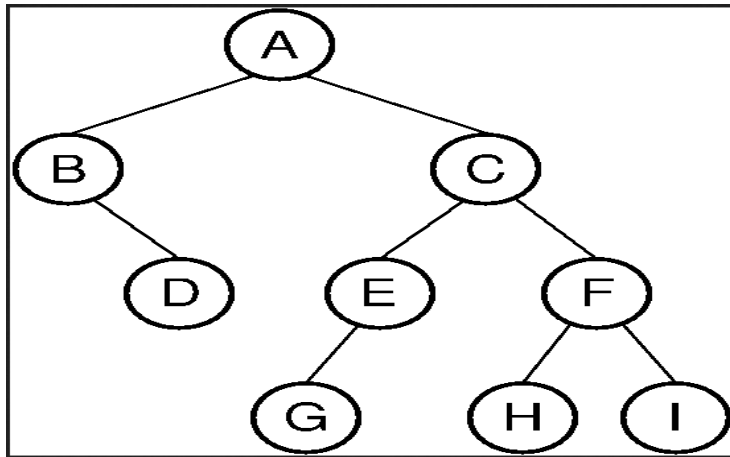
Rule 3: If patient has been sick over one month AND patient has a fever, Then we suspect a Bacterial infection.

Given the facts: Patient temperature is 42, patient has sore throat and patient has been sick for two months, use backward chain reasoning to determine if the patient has a strep throat.

NB: Indicate the reasoning procedure.

QUESTION THREE (20 MARKS)

- a) Show the validity of the following statement using a truth table.
 - i) $P \vee (Q \vee R) \Leftrightarrow (P \vee Q) \vee R$ (4 marks)
 - ii) $((P \vee H) \wedge \neg H) \Rightarrow P$ (4 marks)
- b) Describe THREE tools or environments that can be used to do AI based projects. (6 marks)
- c) Perform a breadth first search on the tree below to show how the nodes shall be visited. (6 marks)



QUESTION FOUR (20 MARKS)

- a) Frames and Semantic networks are knowledge representation schemes. Highlight three advantages for each of these schemes. (6 marks)
- b) Discuss the application of machine learning in the following areas:
- i) Customer segmentation (2 marks)
 - ii) Fraud detection (2 marks)
 - iii) Weather prediction (2 marks)
- c) Represent the following sentences into a semantic network. (8 marks)
- | | |
|--------------------------------|---------------------------------|
| Circus elephants are elephants | Elephants are animals |
| Elephants have head | Animals have hearts |
| Heads have mouths | Circus elephants are performers |
| Elephants have trunks | Horatio is a circus elephant |

QUESTION FIVE (20 Marks)

- a) Explain FOUR types of intelligence (8 marks)
- b) Discuss the Alpha Beta Pruning method for game playing. (4 marks)
- c) You have been selected to be part of the team that is assigned the task of developing a chat bot for Machakos University customer care. Describe the steps you will use to achieve this task as a team. (8 marks)