



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF ENGINEERING, APPLIED SCIENCES AND
TECHNOLOGY

DEPARTMENT: COMPUTER SCIENCE AND INFORMATION SYSTEMS

MODULE: ARTIFICIAL INTELLIGENCE

CODE: BCOS422

SESSIONAL EXAMINATIONS

JUNE 2024

DURATION: 3 HOURS

EXAMINER: Dr C. KURANGA

INSTRUCTIONS

1. Answer ***any four*** questions
2. Each question carries 25 marks
3. Start a new question on a fresh page

Additional material(s): None

Question 1

- a) Describe the motivation for developing intelligent systems. [10]
- b) Explain the role of the intelligent systems and their potential benefits. [8]
- c) Outline the major difficulties in developing these systems. [7]

Question 2

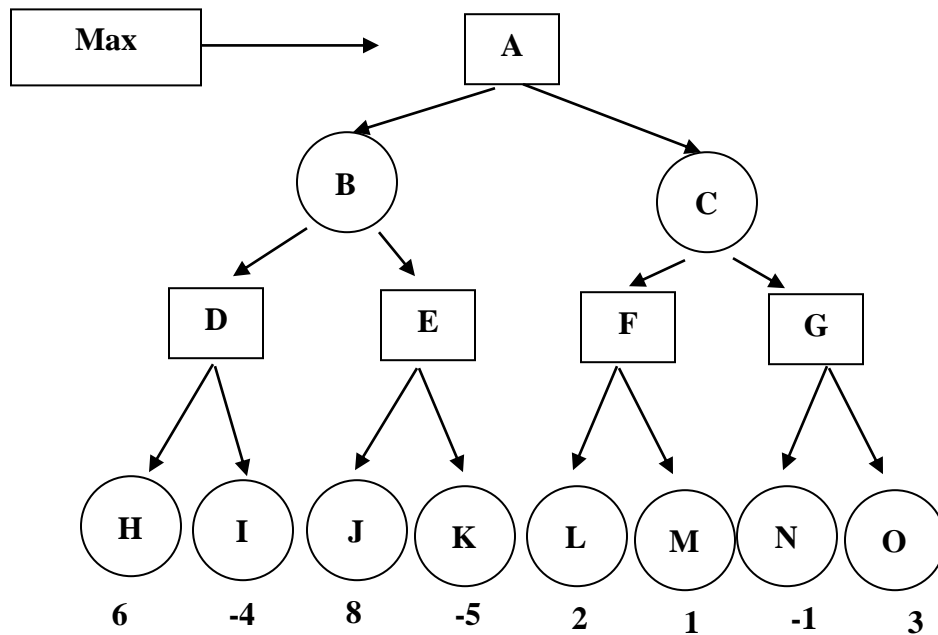
- a) Describe knowledge representation and knowledge acquisition. [10]
- b) Describe any five 'agent' environments. [10]
- c) Describe domain tasks of Artificial Intelligence. [5]

Question 3

- a) Nim is a two-player game. The rules are as follows:
The game starts with a single stack of 7 tokens. At each move a player selects one stack and divides it into two non-empty, non-equal stacks. A player who is unable to move loses the game.
Draw the complete search tree for Nim. [7]
- b) Assume two players, min and max, play Nim (as described above). Min plays first.
If a terminal state in the search tree developed above is a win for min, a utility function of zero is assigned to that state. A utility function of 1 is assigned to a state if max wins the game.

Apply the minimax algorithm to the search tree to assign utility functions to all states in the search tree. [5]
- c) If both min and max play a perfect game, who will win? Explain your answer and show the path taken by the player that wins. [3]

- d) Given the following search tree, apply the alpha-beta pruning algorithm to it and show the search tree that would be built by this algorithm. Make sure that you show where the alpha and beta cuts are applied and which parts of the search tree are pruned as a result. [10]



Question 4

- a. Write algorithm for depth first search and breadth first search. [10]
- b. Explain how heuristically informed procedure improves the search process. [8]
- c. Examine backtracking technique as it applied in Artificial Neural Networks. [7]

Question 5

- a) Write the following using first order predicate logic:
 - i. For everyone there is someone to love; [3]
 - ii. Every house is owned by somebody; and [3]

iii. Kudzwai owns a house. [3]

b) Interpreter the following first order predicate logic:

i. $\exists x. Owns(Tatenda, x) \rightarrow Cat(x)$; and [3]

ii. $\forall x \exists y married(x, y) and \forall z(married(x, z) \rightarrow y = z)$ [3]

c) Draw the semantic net for the following given statement:

Scooter is a two-wheeler and it is a moving vehicle. Vehicle needs an engine, a fuel system to sustain the engine running, an electric System for its lights, horn and breaks. [10]

Question 6

a) Outline any two differences between traditional computer system programs and expert systems. [4]

b) With the aid of examples, explain various problem characteristics. [8]

c) Explain the meaning of a production system in Artificial Intelligence with example. Explore are the main components of a production system, write in details about each component. [7]

d) Examine the difference between procedural knowledge and declarative knowledge. [6]

END OF EXAMINATION