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University Examinations 2024/2025

FOURTH YEAR FIRST SEMESTER FOR THE DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY

CCS 3400: KNOWLEDGE BASED SYSTEMS

DATE: JANUARY 2025 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **ONE** (Compulsory) and any other **TWO** questions*

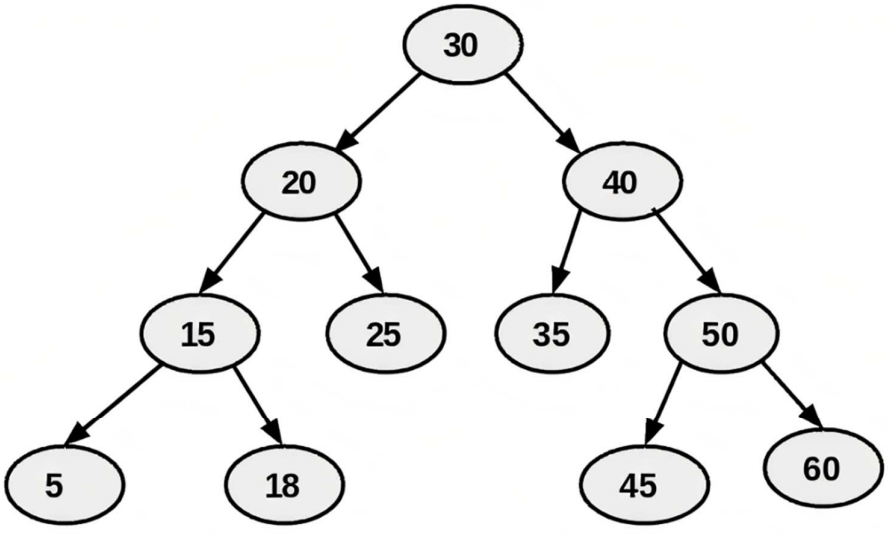
QUESTION ONE (30 MARKS)

a) Traverse the following tree using the below methods. (Ensure you explain each method)

i. In-order traversal (3 marks)

ii. Pre-order traversal (3 marks)

iii. Post-order traversals. (3marks)



b) Explain the concept of a semantic network and describe its primary components (3 Marks)

c) Describe what a frame is in the context of knowledge representation, listing its primary components (4 marks)

d) Discuss the commercial advantages of adopting Artificial Intelligence in businesses, giving specific examples (4 Marks)

e) Construct a semantic network using the below information. (8 marks)

Dogs are mammals	Birds have wings
Mammals are animals	Bats have wings
Birds are animals	Bats are mammals
Fish are animals	Dogs Chase Cats
Worms are animals	Cats eat Fish
Cats are animals Cats have fur	Birds eat Worms
Dogs have fur	Fish Eat Worms

f) Explain what Knowledge-Based Systems (KBS) are and describe their main components. (2 Marks)

QUESTION TWO (20 MARKS)

a) Explain the concept of heuristic search and how it improves the efficiency of problem-solving in AI. (5 Marks)

b) Discuss the role of reasoning and inference in Knowledge-Based Systems and how these processes contribute to problem-solving? (5 Marks)

c) Describe and differentiate between deductive reasoning and inductive reasoning with examples. (5 Marks)

d) Discuss the role of reasoning methods such as rule-based systems and case-based reasoning in artificial intelligence. (5 Marks)

QUESTION THREE (20 MARKS)

a) Discuss the main components of an expert system (5 Marks)

b) Describe types of knowledge used in expert systems with examples (5 Marks)

c) Using an example, describe how frames can be used to represent complex objects and situations (5 Marks)

d) Discuss three key advantages of using semantic networks over other knowledge representation methods (5 Marks)

QUESTION FOUR (20 MARKS)

a) Explain the role of knowledge representation in improving decision-making processes in AI applications. (5 Marks)

b) Discuss key properties of a good knowledge representation system (5 Marks)

c) Explain the concept of 'knowledge update and maintenance' in knowledge representation systems and its significance. (5 Marks)

d) Discuss the application of knowledge representation in healthcare, focusing on its role in diagnostic systems. (5 Marks)

QUESTION FIVE (20 MARKS)

a) Discuss Prolog and its primary applications in artificial intelligence (5 Marks)

b) Describe the advantages and disadvantages of using Prolog for knowledge representation and reasoning compared to other programming paradigms. (5 Marks)

c) Discuss how Knowledge-Based Systems can be used to support decision-making in an organization. Provide an example. (5 Marks)

d) Explain how Knowledge-Based Systems differs with traditional expert systems (5 Marks)