NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

EXPERT SYSTEMS AND DECISION SUPPORT SYSTEMS

SCS 4214

Examination Paper

March 2025

This examination paper consists of 4 pages

Time Allowed: 3 hours
Total Marks: 100
Examiner's Name: Mr J. Mutengeni
External Examiner: Doctor Gombiro

INSTRUCTIONS

1. Answer any four (4) questions
2. Each question carries 25 marks
3. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	**25**
2.	**25**
3.	**25**
4.	**25**
5.	**25**
TOTAL	**100**

QUESTION ONE

a) Define an expert system. Explain its key components with a diagram. **[10]**

b) What is the difference between forward chaining and backward chaining? Provide examples of when each method is more appropriate. **[15]**

QUESTION TWO

a. Explain the following methods of Inference

i. Auto epistemic **[2]**

ii. No monotonic **[2]**

iii. Intuition **[2]**

iv. Analogy **[2]**

v. Induction **[2]**

b. Convert the following knowledge into a semantic network representation:

- "A car is a vehicle."
- "A vehicle has an engine."
- "An engine requires fuel."
- "A car is driven by a driver."
- "A driver is a person." **[15]**

QUESTION THREE

a. Use a truth table to represent the following facts. If I have a pen and I have a question paper then I don't have a pen or I don't have a question paper **[10]**

b. Discuss the impact of machine learning and big data on the development of expert systems. How can expert systems be integrated with other AI technologies to enhance their capabilities? **[15]**

QUESTION FOUR

a. Represent the following facts using Prolog

Kudzi likes cheese **[2]**

John is Sarah's brother **[3]**

b. A company wants to develop an expert system to assist in troubleshooting network issues. What steps would you take to design and implement this system?

[10]

c. What are the advantages and disadvantages of using expert systems compared to human experts? **[10]**

QUESTION FIVE

a) Using logical symbols and a truth table, determine if the following two sentences are logically equivalent. **If you buy a car then you cannot buy a house. If you buy a house then you cannot buy a car.** **[5]**

b) List and explain the four fundamental components of a semantic network

[8]

c) Create a state space diagram that shows all the possible states for the following problem:-

A farmer, fox, goat and cabbage are on one bank of a river. A boat must be used to transport them to the other side of the river. However the boat can only carry two at a time (and only the farmer can row) .If the goat is left with the fox and the farmer is not there, then the fox will eat the goat. If the goat is left alone with the cabbage then the goat will eat the cabbage.

[12]

END OF QUESTION PAPER