



UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**FOURTH YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN INFORMATION
COMMUNICATION AND TECHNOLOGY**

BICT 415: KNOWLEDGE BASED SYSTEMS

STREAM: R

TIME: 2 HRS

DAY: TUESDAY [11.30 – 13.30 P.M]

DATE: 03/02/2026

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS: Section A is compulsory and has **30 marks**.

Attempt any **TWO** questions from Section B. Each question has **20 marks**.

SECTION A – 30 MARKS (ANSWER ALL QUESTIONS)

QUESTION ONE (30 MARKS)

- (a) Clearly describe the following terms:
 - i. Case-based reasoning **(2 Marks)**
 - ii. Recommender system **(2 Marks)**
- (b) "An expert system should be able to justify its conclusions". Clearly explain this statement **(2 Marks)**
- (c) Describe any **FOUR** types of knowledge that constitute expertise **(4 Marks)**
- (d) Reasoning is the process of drawing inferences or conclusions; moving from what is known (fact) to what is unknown (inference). Discuss ant **THREE** types of reasoning **(6 Marks)**
- (e) Describe the architecture of a typical rule based expert system **(5 Marks)**
- (f) A doctor is only 55% certain that if a patient has a fever then it means that the patient has the Malaria. The doctor is also only 68% and 20% certain that if a patient has joint aches and a headache respectively then it means that the patient has the Malaria. Given that the patient has both a fever, joint aches but no headache, how confident is the doctor that the patient is suffering from the Malaria? **(5 Marks)**
- (g) Discuss the following applications of expert systems using appropriate examples
 - i. Customer care **(2 Marks)**
 - ii. Credit Analysis **(2 Marks)**

SECTION B

QUESTION TWO [20 MARKS]

- (a) Describe **THREE** advantages and **THREE** disadvantages of Expert Systems **(6 Marks)**
- (b) Distinguish between data-directed and goal-directed analysis in rule-based systems. Which is preferred for medical diagnostic systems and why? **(5 Marks)**
- (c) In Laikipia County, 54% of the adults are females. One adult is randomly selected for a survey to determine the level of education of the residents in this county. It is later learned that the selected survey subject has no formal education. Also, 7.5% of males in this county do not have a formal

education, whereas 10.6% of females do not have a formal education. Find the probability that the selected subject is a male **(6 Marks)**

- (d) Clearly explain when it is ideal to use Case Based Reasoning for a specific problem

(3 Marks)

QUESTION THREE [20 MARKS]

- (a) Knowledge elicitation consists of a set of techniques for collecting the knowledge of domain experts. There are many different techniques which can be used for knowledge elicitation. Select one application domain for which a knowledge base might be created. Outline **ONE** suitable techniques which could be used for knowledge elicitation in your chosen application domain, highlighting **TWO** advantages and **TWO** disadvantages of this technique **(6 Marks)**
- (b) Explain who are the persons who determine the success of expert system and development **(4 Marks)**
- (c) Discuss how they can guarantee the failure of expert systems project **(4 Marks)**
- (d) Draw and describe the architecture of a fuzzy logic **(6 Marks)**

QUESTION FOUR [20 MARKS]

- (a) You are to build a ruled based expert system for student course registration to be used at Laikipia University. Write the rules and you would need for this system to run successfully. The goal of the main rule of this system is "STUDENT REGISTERED". **(5 Marks)**
- (b) "One of the most often heard criticisms of Artificial Intelligence (AI) is that machines cannot be called intelligent until they are able to learn to do new things and adapt to new situations, ..." Argue either for or against this statement using expert systems as your platform **(6 Marks)**
- (c) A useful tool to assist students to revise and prepare for examinations is an Intelligent Examination Question Recommender System
- i) What are the important aspects about a student that you would incorporate? **(3 Marks)**
- ii) Discuss in detail how you would setup this Recommender System **(6 Marks)**

QUESTION FIVE [20 MARKS]

- (a) Asthma occurs in about 30% of patients referred with respiratory distress symptoms to the Centre for Respiratory Diseases at the Nairobi Hospital. A new test has been proposed for the early detection of Asthma with the following characteristics:

	Asthma	No Asthma
Test A Positive	85%	6.1%
Test A Negative	15%	93.9%

- i. What is the prior probability of bladder cancer, $p(\text{Asthma})$ at this centre? **(1 Mark)**
- ii. What is the likelihood ratio of a Test A Positive for asthma **(2 Marks)**
- iii. What is the posterior probability $p(\text{Asthma} \mid \text{Test A Positive})$ **(2 Marks)**
- (b) Examine the difficulties encountered in Knowledge Acquisition **(5 Marks)**
- (c) Explain the basic CLIPS commands used to manipulate facts **(5 Marks)**
- (d) Discuss how you would evaluate a Case Based Reasoning system **(5 Marks)**