

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY  
FACULTY OF APPLIED SCIENCE  
COMPUTER SCIENCE DEPARTMENT  
AUGUST EXAMINATIONS 2009**

**SUBJECT: EXPERT SYSTEMS  
CODE: SCS 4207**

**INSTRUCTION TO CANDIDATES**

**Answer FIVE QUESTIONS  
ALL QUESTIONS CARRY 20 MARKS**

**3 hours**

**QUESTION ONE**

- a) Define a Bayesian net giving illustrations [5]
- b) Construct a diagram of a general model of a learning agent and discuss its components. [10]
- c) Give an example of “Generalised Modus Ponens”. [5]

**QUESTION TWO**

Give five areas in which expert systems are used. You must give illustrations and examples. [20]

**QUESTION THREE**

- a) Given that Rule A below has a certainty factor of 0.9 and Rule B has a certainty factor of 0.8, A has certainty 0.9, B has certainty 1.0, and C has certainty of 0.8, a) what is the certainty of D? [10]
- b) What is the certainty of K? [10]

Rule A: IF (A or B or C) THEN D

Rule B: IF (B and D) THEN K

#### **QUESTION FOUR**

- a) Compare and contrast the three different levels of interviewing. Indicate the advantages and disadvantages of each type of interview [10]
- b) Discuss the repertory grid. Construct one comparing and contrasting four different types of animals. [10]

#### **QUESTION FIVE**

- a) State the potential benefits of expert systems in commercial environments. [10]
- b) Given the production rules:

**Rule 1: if associated (disease, Sign)  
and has-symptom (Patient, Sign)  
then add investigate (Patient,Disease).**

**Rule 2: if test-for (disease, Test)  
and investigate (Patient,Disease)  
then add request-test (Patient,Test).**

and these initial facts in working memory (most recently added facts are at the top):

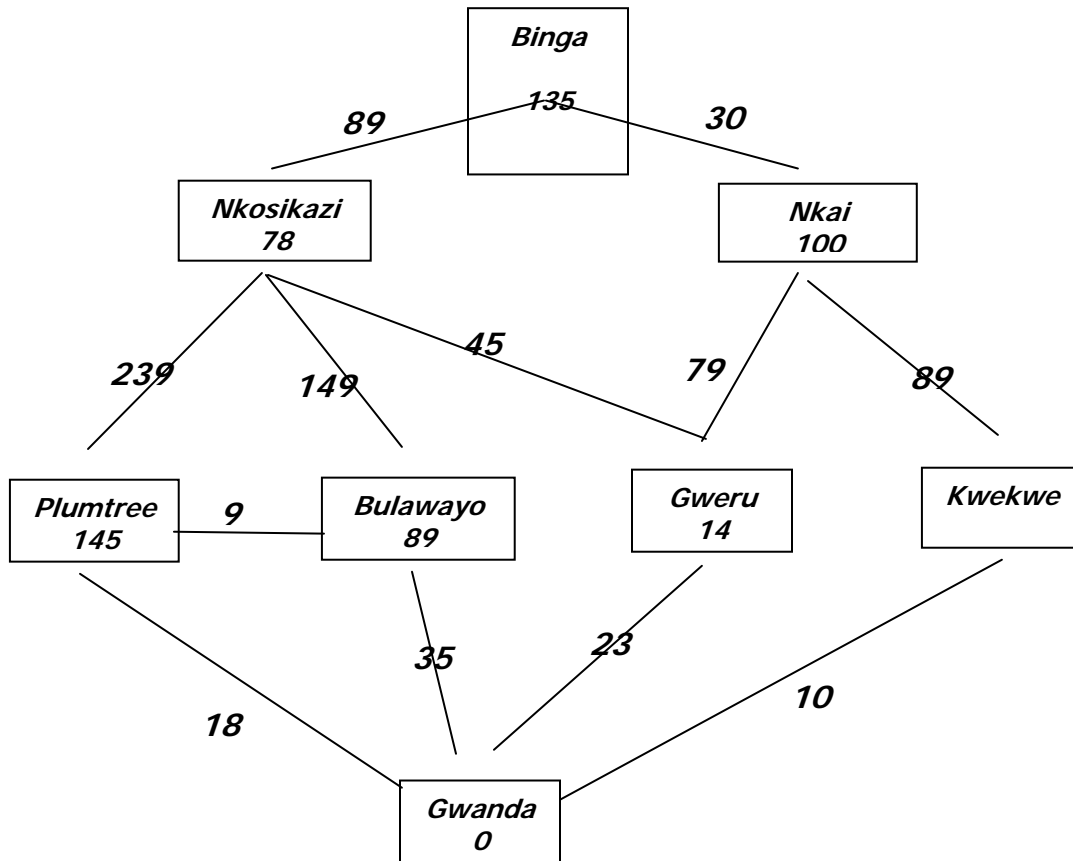
**associated (malaria,jaundice).  
associated (hepatitis, nausea).  
associated (hepatitis, jaundice).  
test for (hepatitis, liver-function).  
test for (malaria, microscopy).  
has-symptom (moyo, nausea).  
has-symptom (moyo, jaundice).**

Show the conflicts sets and changes to working memory for 4 cycles of forward-chaining, using conflict resolution strategies (in order of priority):

[recency, rule order] [10]

**QUESTION SIX**

Consider the Search Tree below. You are trying to reach HOME. The numbers in the boxes indicate the straight line distance that each city is from HOME and the numbers on the paths are the miles between the respective cities.



What will be the sequence of cities visited using the following search methods:

- a) Depth-first \_\_\_\_\_ [6]
- b) A\* \_\_\_\_\_ [7]
- c) Greedy Best-First \_\_\_\_\_ [7]

## **QUESTION SEVEN**

- a) What are the components of an expert system? Explain the structure and function of each component. [5]
- b) Discuss how each component of an Expert system contributes to distinguishing an Expert System from other Software systems? [15]

**END OF QUESTION PAPER**

