CHUKA UNIVERSITY

EXAMINATION FOR MASTER OF SCIENCE IN COMPUTER SCIENCE Y1S2

COSC 845 : EXPERT SYSTEM AND KNOWLEDGE ENGINEERING

DATE: **TIME: 3 HRS**

INSTRUCTIONS:

Answer Question ONE and ANY other TWO Questions

Question 1 (30 Marks)

a) Discuss the role of knowledge in expert system development. **(4 Marks)**

b) Differentiate between Problem Domain and Knowledge Domain as applied in expert system and knowledge engineering. **(4 Marks)**

c) Explain six characteristics of an effective knowledge engineer. **(6 Marks)**

d) Expert system community have pointed out that knowledge acquisition is mostly considered the bottleneck in the development of knowledge base system. Explain four reasons why this is True. **(4 Marks)**

e) Knowledge engineering is a branch of AI that develops rules that are applied to data in order to imitate the thought process of a human that is an expert on a specific topic. Discuss the three stages of knowledge engineering. **(6 Marks)**

f) Expert systems are designed to give expertise advise in various areas of applications. Describe the following areas showing the expertise that is being computerized. **(6 Marks)**

   i. Medical diagnostic systems

   ii. Weather forecasting systems

Question 2 (15 Marks)

a) Describe the protocol analysis method of knowledge acquisition using appropriate illustration. **(7 Marks)**

b) Consider the following knowledgebase for a medical expert system of a research organization. It stores details of diseases, medicines recommended for the diseases and the patients who have suffered from the diseases.

```
disease(cholera, bacteria, contagious, very_fast).
disease(malaria, parasite, contagious, fast).
disease(diabetes, hereditary, non_contagious, slow).
disease(hypertension, hereditary, non_contagious, slow).

disease_medicine(malaria, medA).
disease_medicine(malaria, medB).
disease_medicine(malaria, medC).
disease_medicine(cholera, medD).


area(chuka, hypertension,67).
area(chuka, malaria,25).
area(nairobi, diabetes,86).
```

i. Write a rule to input the name of a disease and output all medicines of the disease. **(4 Marks)**

ii. Write a rule to input a disease name and output all the areas with the disease as well as the number of patients. **(4 Marks)**

iii.

Question 3 (15 Marks)

a) Discuss some of the main technical problems one has to overcome when attempting to build a successful Expert System for a new domain. **(4 Marks)**

b) Weigh the pros and cons of expert systems. Describe at least 3 advantages that expert systems offer organizations that would otherwise have to employ human experts. **(4 marks)**

c) Explain what is knowledge base, and how is it generated? **(3 marks)**

d) With an aid example in each case, explain the work of the following in Prolog programming language? **(4 Marks)**

(i) .

(ii) ;

(iii) :-

(iv) _

Question 4 (15 Marks)

a) With an aid of diagram discuss the components of an expert system**.** **(7 Marks)**

b) Write a prolog program that lets the user input a number (*N*) and then output N^3. This processing should repeat until the user inputs *S* to stop. **(3 Marks)**

c) Write the output of the following Prolog Program. **(5 Marks)**

```
compute:- nl, R is 2, func(R,0).

func(5,Q):- write(Q).

func(R,T):- X is (R+T), Y is (R+1), func(Y,X).
```

Question 5 (15 Marks)

a) Discuss this statement: "The power of an Expert System is derived from the specific knowledge it possesses, not from the particular formulas and inference schemes it employs." **(4 Marks)**

b) Explain how Expert System can distribute (or redistribute) the available knowledge in an organization. **(4 Marks)**

c) Discuss the difference between Intelligence and Expertise as used in Expert system and knowledge engineering. **(3 Marks)**

d) The following are some of the earlier implementations of Expert systems. Discuss each of them while indicating the contributions they have made to the world of Artificial Intelligence. **(4 Marks)**

i. MYCIN

ii. DENDRAL