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*(KNOWLEDGE FOR DEVELOPMENT)*

**KIBABII UNIVERSITY**

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**UNIVERSITY EXAMINATIONS  
2017/2018 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS  
FOUR YEAR SECOND SEMESTER**

**FOR THE DEGREE IN COMPUTER SCIENCE**

**COURSE CODE: CSC 227**

**COURSE TITLE: LOGIC PROGRAMMING**

**DATE: 17/10/2018**

**TIME: 11.30-1.30PM**

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**INSTRUCTIONS**

**ANSWER QUESTIONS ONE AND ANY OTHER TWO.**

**QUESTION ONE [30 MARKS]**

- a. Explain how logic programming different from other programming paradigm [4 marks]
- b. Discuss the basic components of a logic programming program [6 marks]
- c. Using suitable examples, differentiate between a **fact**, a **goal** and a **rule**. [6 marks]
- d. Describe how one can translate the predicate logic into a prolog code. [7 marks]
- e. i. State and explain the DE Morgan's law of logic. [4marks]  
ii. Prove the DE Morgan's law of logic using an appropriate truth table [3marks]

**QUESTION TWO [20 MARKS]**

- a. Explain various steps followed to consult a prolog program [5 marks]
- b. Consider the following program used to create a database of fact about diseases.

*disease(malaria).*  
*disease(tetanus).*  
*disease(tuberculosis).*  
*disease(typhoid).*  
*sytmptom(malaria,headach).*  
*sytmptom(malaria ,fever).*  
*sytmptom(malaria, vomit).*  
*sytmptoms(tuberculosis,dry\_cough).*  
*Sytmptoms(tuberculosis,headach).*

- i. Write a prolog query that will generate the diseases? [2 marks]
- ii. Write a prolog query that will generate all the diseases with their specific symptoms [4 marks]
- iii. Explain how prolog compiler will evaluate the following query [5 marks]  
**? - desease(X),symptom(X,headach).**
- iv. Explain how prolog achieves backtracking using the above programme? [4 marks]

**QUESTION THREE [20 MARKS]**

- a. i. Explain how one can Convert a sentences to conjunctive normal form. [6 marks]  
ii convert the following sentences into conjunctive normal form [9 marks]  
 $(A \rightarrow B) \vee (B \rightarrow A)$   
 $(P \rightarrow (Q \rightarrow R)) \rightarrow (P \rightarrow (R \rightarrow Q))$   
 $(P \rightarrow Q) \rightarrow ((Q \rightarrow R) \rightarrow (P \rightarrow R))$

- b. Show that  $P \models Q \leftrightarrow (\text{True} \models P \rightarrow Q)$ . [5 marks]

**QUESTION THREE [20 MARKS]**

- a. Define the following concepts as used in the study of PROLOG: [6 marks]

- i. Binding Variables
- ii. Backtracking
- iii. Cut function

- b. Identify facts and rules in the program below: [2 marks]

married(mary).

married(jack).

married(cavin).

married\_father(X,Y):-married(X),father(X,Y).

- c. Discuss the FOUR variation of implication giving an example for each case. [12 marks]

**QUESTION FOUR [20 MARKS]**

- a. Explain the following terms as used in the study of logic programming [8 marks]

- i. Modus ponens
- ii. Modus Tollens
- iii. Resolution
- iv. Converse of an implication

- b. Discuss some real life application of logic programming [12 mark]

**QUESTION FIVE [20 MARKS]**

Use the following premises to deduce the conclusion "r" via formal deductive argument: [10 marks]

- a.  $s \rightarrow p$
- b.  $w \wedge \sim z$
- c.  $\sim p$
- d.  $\sim z \rightarrow (s \vee q) \vee r$
- e.  $w \vee y \rightarrow \sim q$

Determine, via formal proof or disproof, whether the following argument form is valid: [10 marks]

- $p \vee \sim q \vee r$   
 $\sim q \rightarrow \sim p$   
 $r \rightarrow \sim p \vee q$   
 $\therefore r$