The Open University of Sri Lanka
B. Sc. Degree Programme – Level 04
Open Book Test -2007
CSU 2280: Deductive Reasoning and PROLOG for Artificial Intelligence
Duration: One and half hours

Date: 16.10.2007 Time: 4.00pm -5.30 pm

Answer All Three Questions.

Q1.

a. Identify the well –formed expressions from the following formulas

i. $A \wedge \neg B$
ii. $(P \vee \neg Q) \leftrightarrow \neg(\neg R)$
iii. $A \wedge B \wedge \neg A$
iv. $\vee(A \wedge \neg B) \leftrightarrow \neg C$

b. Using truth tables determine whether the following are Tautologies, Contradiction or neither

i. $(A \rightarrow \neg A) \rightarrow (A \rightarrow B)$
ii. $\neg (A \wedge B) \rightarrow \neg A \vee \neg B$
iii. $(\neg C \rightarrow A) \wedge (A \vee \neg C) \rightarrow B)$
iv. $(A \rightarrow B) \wedge (\neg B \rightarrow C)$

c. Using methods of inference rules or truth tables, show that

i. $P \rightarrow Q \equiv \neg P \vee Q$
ii. $P \rightarrow Q \equiv \neg Q \rightarrow \neg P$
iii. $P \rightarrow Q, Q \rightarrow R \equiv P \rightarrow R$
iv. $P \vee Q, \neg Q \equiv P$

Q2.

a. Consider the following two statements and the two claims.
S1: If the JVP goes to opposition, then the president goes for an election.
S2: If president does not go for an election, then the president goes to peace talks.

C1: If president does not go to the peace talks, then the JVP goes to opposition.
C2: If JVP goes to opposition or president does not go to peace talks, then president goes for an election.

1. Translate the statements and the claims into propositional logic, using appropriate atomic propositions.

2. Check whether C1 and C2 are valid claims (Hint: if C1 is valid then $(S1 \wedge S2) \rightarrow C1$ becomes a tautology).

b. Using your own words, explain the meaning of the following logic formulae.

1. $\forall x P(x)$
2. $\exists x P(x)$
3. $\forall x \exists y P(x, y)$
4. $\exists y \forall x P(x, y)$

c. Translate the following expressions of propositional logic into English (Assume the key A,B and C)

1. $A \wedge B$
2. $(A \wedge C) \rightarrow C$
3. $A \vee \neg C$

Q3.

a. Explain what is Reasoning with suitable examples. (Do not write example given in your course material).

b. Briefly explain, which reasoning technique or techniques can be used to solve the following:

1. Find data form a table
2. Solve a mathematical problem
3. Calculate net pay for an employee
4. Develop a Computer program for a small library

c. Faculty of Natural science has several departments such as Botany, Zoology, Chemistry, Mathematics and Computer Science etc.. Each department conducts day schools, practical sections OBT, CBT and Practical Test. you need to develop a Computer program to automatically generate master time table of each semester. Note that, each student has to follow courses in any three departments and Faculty resources are limited such as lecture halls, Labs etc.

1. Which type of reasoning method is best for the above program.
2. Which reasoning technique/techniques can be used to develop above program.
3. What are the main problems you need to solve using above reasoning techniques, explain briefly.