THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 04
OPEN BOOK TEST: 2010
CSU2280: DEDUCTIVE REASONING AND PROLOG FOR ARTIFICIAL INTELLIGENCE
DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 04th September, 2010 Time: 4.00 pm – 5.30 pm

Answer ALL questions.

Q1.

a) Explain the term "Reasoning" in your own words.

b) What are the seven reasoning techniques? Explain using suitable examples. (Do not write any example that is included in your course material)

c) What is the most suitable reasoning technique for each of the following case? Give a reason for each answer.

i. Creating a mobile application to display GP values
ii. Creating a system for an ATM machine
iii. Solving a set of mathematical equations using relevant approximations
iv. An Electrician finding a fault with electrical equipments
v. Designing computer software to maintain an airport.

Q2.

a) Using truth tables, define the terms "Tautology", "Contradiction", "Model assignment" and "Counter example".

b) Using truth tables show that;

i. $(A \cap B) \rightarrow \neg A \cup \neg B$
ii. $(A \vee B) \rightarrow (C \wedge D) \equiv \neg(A \vee B) \vee (C \wedge D)$

c) Translate the following Propositional Logic statements into English.

i. $A \leftrightarrow (B \cup C)$
ii. $\neg(P \vee Q) \wedge \neg(P \rightarrow Q)$

d) Convert the following facts and rules into Predicate and Propositional Logic.

If there is a good practice schedule, a cricket team can win the match. If the ballers ball well and the batsmen play well then the team can win the game. If the batsmen play well and the ballers do not play well then the team does not win the game.

Ballers play well and there is no practice schedule.

Q3.

a) What are the differences between Propositional Logic and Predicate Logic?

b) Explain the meaning of the following Predicate Logic expressions, in your words.

i. $\exists x \forall y F(x, y)$

ii. $\exists x Q(x, y) \wedge \forall P(y, x)$

c) Consider the following two statements (S1 and S2) and the claim (C1).

S1: If work hard for the examination, then if sit the exam in August then pass the exam in December

S2: Not pass the examination in December

C1: Sit the exam in August then not work hard for the examination

A - Work hard for the examination
B - Sit the exam in August
C - Pass the exam in December

i. Translate the above S1, S2, C1 into Propositional Logic using appropriate atomic propositions.

ii. Check whether C1 is a valid claim.
(*Hint: C1 is valid then* $(S1 \cap S2) \rightarrow C1$ *becomes a tautology*)

THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 04

CLOSED BOOK TEST: 2010/2011

CSU 2280: DEDUCTIVE REASONING AND PROLOG FOR ARTIFICIAL INTELLIGENCE

DURATION: **ONE AND HALF HOURS** (1 ½ HOURS)

Date: 19th October, 2010 Time: 4.00 pm – 5.30 pm

Answer ALL questions.

Q1.

a) What is PROLOG? Explain your answer by comparing with other programming languages.

b) Briefly explain the following terms in the context of PROLOG.

i. Atom
ii. Predicates and Rules

c) Consider the following PROLOG predicates to answer the questions (c) i and (c) ii.

```
parent(rathnapala, sunil).
parent(rathnapala, kamala).
parent(rathnapala, gamini).
parent(rathnapala, ruwini).
parent(gunadasa,  tikiri).
parent(ramyawathi, tikiri).
parent(gunapala, saman).
parent(ramani, saman).
parent(seela, sunil).
parent(seela, kamala).
parent(seela, gamini).
parent(seela, ruwini).
parent(kamala, kasun).
parent(tikiri, kasun).
parent(gunapala, saman).
parent(ramani, saman).
```

```
male(rathnapala).
male(sunil).
male(gamini).
male(kasun).
male(saman).

female(kamala).
female(ruwini).
female(seela).
female(ramani).
female(ramayawhi).
```

i. Create the following PROLOG rules;

`son/2, daughter/2, husband/2 and wife/2`
(Assume that, all these rules have standard meanings.)

ii. Explain how PROLOG will answer the following queries;

a. `?- son(X, Y).`
b. `?- daughter(kamala, rathnapala).`
c. `?- husband(gunapala, ramyawathi).`

Q2.

a) Briefly explain the following PROLOG predicates;

i. `retractall/1`
ii. `bagof/3`
iii. `assert/1`

b) Consider the following two tables to answer the questions from (b) i to (b) vi.

Registration No.	Gender	Name
AS001	M	S. M. Perera
AS002	F	A. B. Silva
AS003	M	R. S. Gamage

Table 1: Student

Registration No.	Course Code	Marks
AS001	CSU2280	95
AS001	CSU2279	65
AS002	CSU2279	45

Table 2: Result

i. Construct these two tables as a PROLOG database.

ii. Create a PROLOG rule called `add_student/0` to add a new student through the keyboard.

iii. Create a PROLOG rule called `edit_marks/0` to update existing marks.

iv. Create a PROLOG rule called `delete_student/0` to delete an existing student (Read the Registration No. of the student as the key)

v. Create a PROLOG rule to list all male students, as in the format given below.

```
Student Details
------------------------------
AS001              S. M. Perera
AS003              R. S. Gamage
------------------------------
```

vi. Create a PROLOG rule to display a result sheet for a given student. Your output should be as follows;

```
Registration No: AS001
------------------------
Course Code            Marks
------------------------
xxxxx              xx
xxxxx              xx
------------------------
```

Q3.

a) Briefly describe the following terms, used in PROLOG.

i. `not/1`

ii. `true, !, fail`

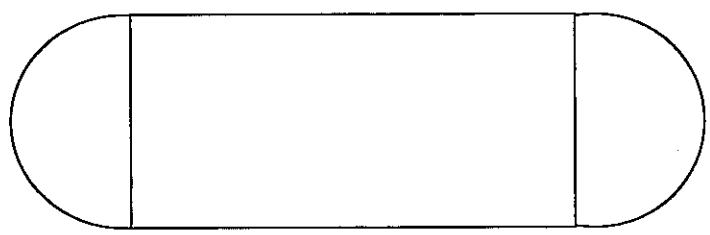
b) Briefly describe the meaning of the following list operations.

i. `length/2`

ii. `flatten/2`

iii. `append/2`

c) Write a PROLOG program to find the area of the following shape.
(***Hint:*** *Read length and width as input and calculate the area.*
Area of a circle $= \pi r^2$, where $\pi = 3.141$ *and* $r =$ *radius*)



d) Create a PROLOG rule to display the grade of the given mark by using *if condition.* (Use the following defined ranges of marks.)

M >= 70 A, 70 > M >= 60 B, 60 > M >= 50 C, 50 > M >= 40 S,
40 > M F

e) Create PROLOG rules to carry out the following list operations.

i. Print a given list into its reverse order.

ii. Display the average value of the given number list.