THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAM: LEVEL 04
CLOSED BOOK TEST: 2009
CSU 2280: DEDUCTIVE REASONING AND PROLOG FOR AI
DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 27ᵗʰ October, 2009 | Time: 4.00 pm – 5.30 pm

Answer ALL questions.

Q1).
   a. Briefly describe the following terms
      i. Atom
      ii. Variable
      iii. Operators
      iv. Predicates

   b. Consider the following Prolog predicates to answer the questions from (b) (i) to (b) (v).

```
parent (saman, sunil).
parent (sunil, ruwan).
parent(kamala, ruwan).
parent(mala, sunil).

male(saman).
male(sunil)
male(ruwan).
female(mala).
female(kamala).
```

      i. Briefly describe the meaning of the Prolog predicate *parent(X, Y)*.
      ii. Define a Prolog predicate *mother/2* to get mother's name for a given child.
      iii. Define a Prolog predicate *child/2* to get child's name for a given parent
      iv. Define a Prolog predicate *grandfather/2* to get grandfather's name for a given child.
      v. Briefly explain how will Prolog answer the following queries.
          ?- grandfather(ruwan, Y).
          ?- grandfather(X, ruwan).

Q2).
   a. Briefly describe the following Prolog predicates.
      i. assert/1
      ii. dynamic /1
      iii. setof/3
      iv. flatten/2

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

Item No	Item Name	Unit price	Quantity
E01	Transistors	20.50	100
E02	TCs	47.25	60
E03	Capacitors	5.00	350
E04	Diodes	2.50	260

Table 1: Product

Cus ID	Cus Name	Address
C01	Saman	Panadura
C02	Ruwan	Maharagama

Table 2: Customer

Cus ID	Product ID	Quantity	Price
C01	E03	5	25.00
C01	E01	10	205.00

Table 3: Sales

i. Construct these three tables as a Prolog data base.

ii. Create Prolog rules called *add_product/0*, *add_customer/0*, *updateproduct/0* and *add_sales/0* in order to add new product, add new customer, update product details and add new sales, respectively.

iii. Create the following list by using *printdetails/1* predicate.

```
?- printdetails('C01').
-----------------------------------------
Customer name:  saman
-----------------------------------------
Capacitors    5     25.00
Transistors   10    205.00
-----------------------------------------
```

Q3).

a. What are the tasks of each of the following Built-in list operations in SWI Prolog?

i. memberchk/2
ii. sort/2
iii. length/2

b. Consider the following Prolog predicates/rules to answer the questions from (b) (i) to (b) (iii).

i.

```
aaa([]).
aaa([H|T]) :- write(H),nl,aaa(T).
```

What is the output of
?- aaa([a,b,[c,[d]],e]).

ii.

```
bbb([],L,L).
bbb([X|L1],L2, [X|L3]) :- bbb (L1,L2,L3).
```
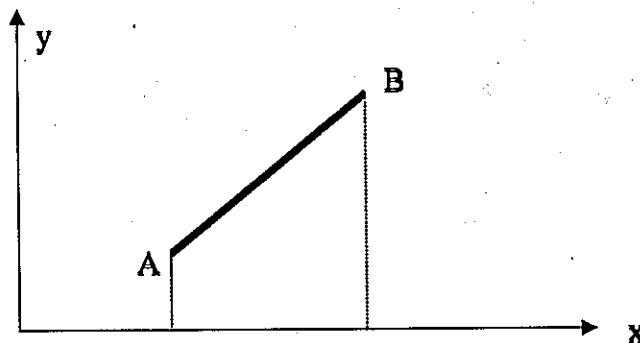
What is the output of
?- bbb([a,b,c], [c], X).

iii.

```
ccc(X,[X|T],T).
ccc(X, [ Y|T], [Y|T]) :- ccc(X,T,T).
```

What is the output of
?- ccc([a,b,c], [c], X).

c. Consider the following graph.

Two end points of the line can be represented by point(X, Y).
        A = point(2, 2).
        B = point(4, 5).

Write a Prolog predicate to calculate the length of the line.
        (Hint: use sqrt/1 predicate to calculate square root.)