

# **Comsats University Islamabad**

## **Attock Campus**



### **LAB ASSIGNMENT 3 & 4**

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Registration : Sp19-bcs-042

Subject : AI ( LAB )

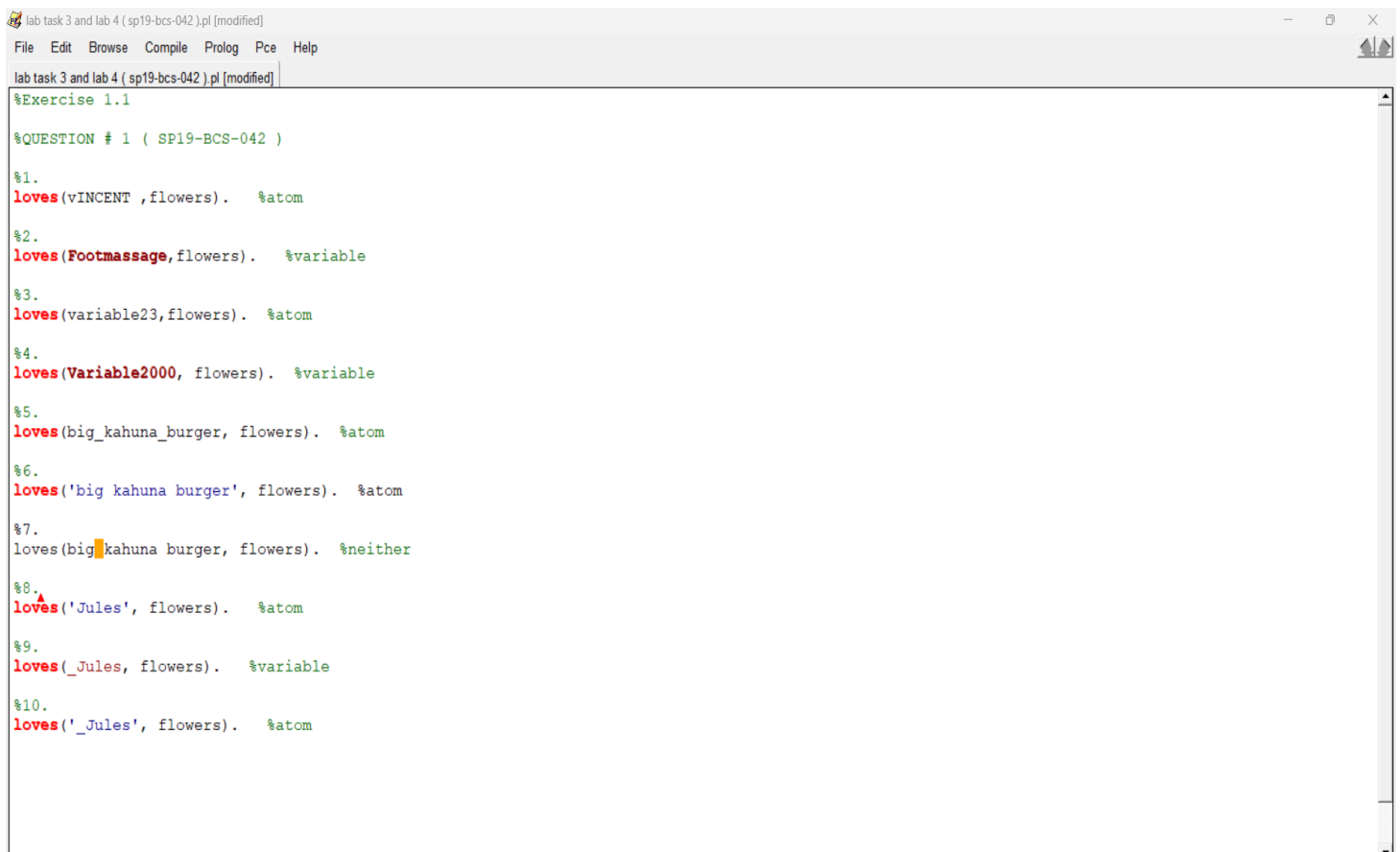
Section : " BCS- 7A "

Date of Submission : 25-12-2022

## Exercise 1.1

**Q no:** Which of the following sequences of characters are atoms, which are variables, and which are neither?

**Ans:**



```
lab task 3 and lab 4 ( sp19-bcs-042 ).pl [modified]
File Edit Browse Compile Prolog Pce Help
lab task 3 and lab 4 ( sp19-bcs-042 ).pl [modified]
%Exercise 1.1

%QUESTION # 1 ( SP19-BCS-042 )

%1.
loves(vINCENT ,flowers).  %atom

%2.
loves(Footmassage,flowers).  %variable

%3.
loves(variable23,flowers).  %atom

%4.
loves(Variable2000, flowers).  %variable

%5.
loves(big_kahuna_burger, flowers).  %atom

%6.
loves('big kahuna burger', flowers).  %atom

%7.
loves(big kahuna burger, flowers).  %neither

%8.
loves('Jules', flowers).  %atom

%9.
loves(_Jules, flowers).  %variable

%10.
loves('_Jules', flowers).  %atom
```

## Exercise 1.2:

**Q no:** Which of the following sequences of characters are atoms, which are variables, which are complex terms, and which are not terms at all? Give the functor and arity of each complex term.

**Ans:**

```
LAB task 3 and lab 4 ( SP19-BCS-042 ).pl [modified]
File Edit Browse Compile Prolog Pce Help
LAB task 3 and lab 4 ( SP19-BCS-042 ).pl [modified]
%Exercise 1.2

%Question 2:
%1.
loves(Vincent,mia). %complex term, loves/2

%2.
'loves(Vincent,mia)'. %atom

%3.
Butch(boxer). %not an atom, variable, or complex term

%4.
boxer(Butch). %

%5.
and(big(burger),kahuna(burger)). %complex term and/2

%6.
and(big(X),kahuna(X)). %complex term and/2

%7.
_and(big(X),kahuna(X)). %not an atom, variable, or complex term

%8.
(Butchkills Vincent). %not an atom, variable, or complex term

%9.
kills(ButchVincent). %not an atom, variable, or complex term

%10.
kills(Butch,Vincen). %not an atom, variable, or complex term

comment(line)
Line: 3
```

### Exercise 1.3:

**Q no:** How many facts, rules, clauses, and predicates are there in the following knowledge base? What are the heads of the rules, and what are the goals they contain?

woman(vincent).

woman(mia).

man(jules).

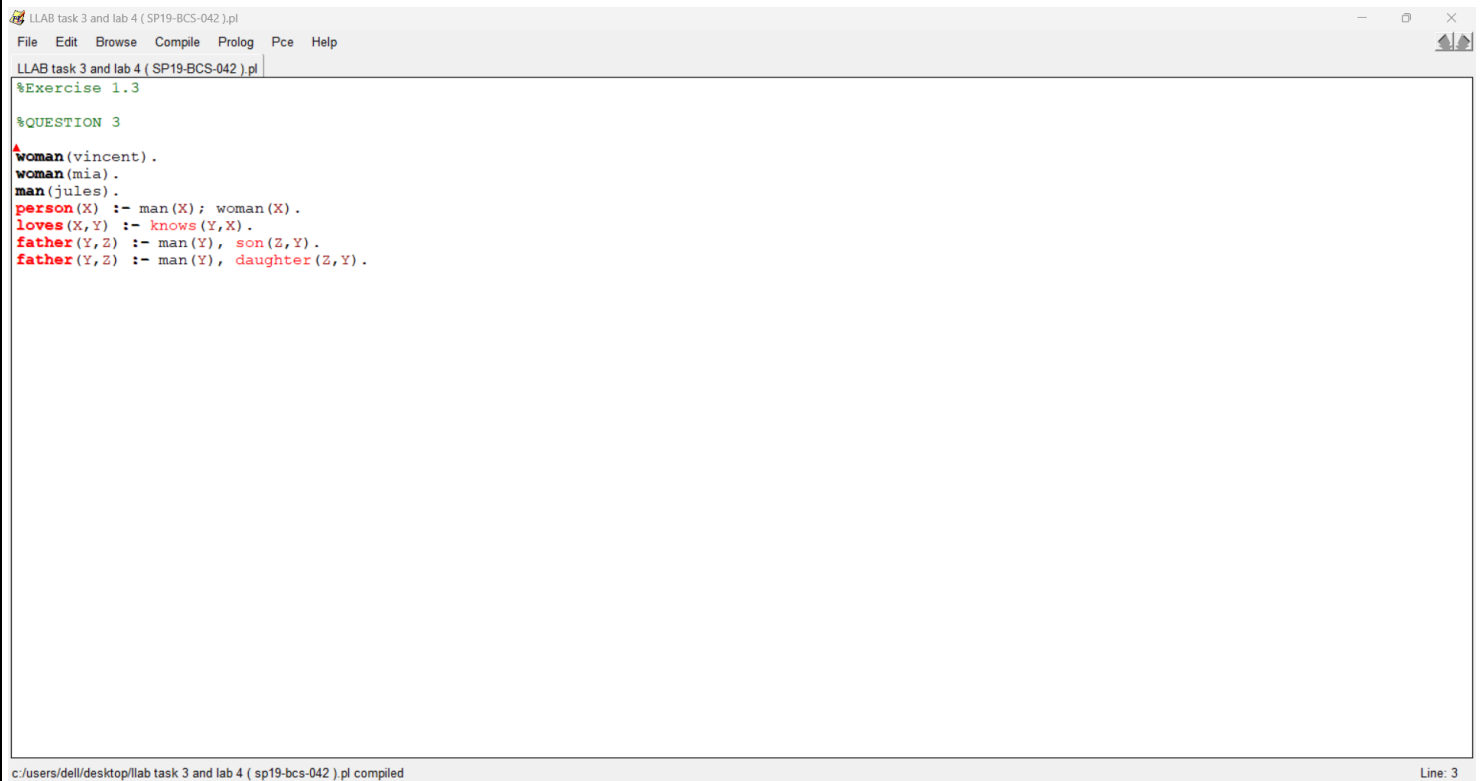
person(X) :- man(X); woman(X).

loves(X,Y) :- knows(Y,X).

father(Y,Z) :- man(Y), son(Z,Y).

father(Y,Z) :- man(Y), daughter(Z,Y).

### Ans:

A screenshot of a Prolog IDE window titled "LLAB task 3 and lab 4 (SP19-BCS-042).pl". The window has a menu bar with "File", "Edit", "Browse", "Compile", "Prolog", "Pce", and "Help". The main text area contains the following Prolog code:

```
%Exercise 1.3

%QUESTION 3

woman(vincent).
woman(mia).
man(jules).
person(X) :- man(X); woman(X).
loves(X,Y) :- knows(Y,X).
father(Y,Z) :- man(Y), son(Z,Y).
father(Y,Z) :- man(Y), daughter(Z,Y).
```

The status bar at the bottom shows the file path "c:/users/dell/desktop/llab task 3 and lab 4 ( sp19-bcs-042 ).pl compiled" and "Line: 3".

1. There are 3 facts and 4 rules which totals 7 clauses. The predicates are woman/1, man/1, person/1, loves/2, and father/2.

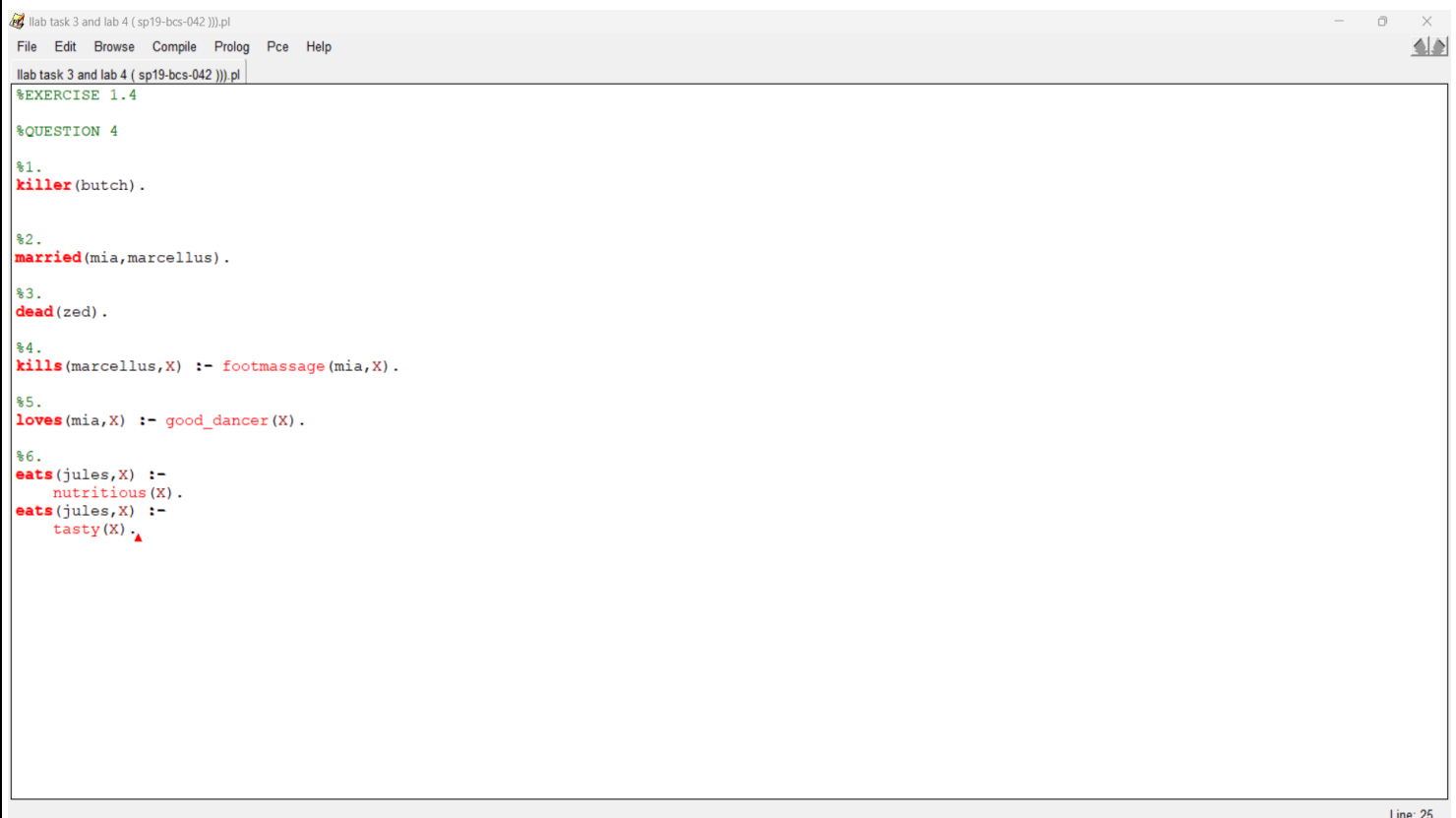
2. The heads of the rules are the left-hand sides of a rule and are `person(X)`, `loves(X,Y)`, and `father(Y,Z)`.
3. The goals of the rules are the right-hand sides of a rule and are `man(X)`, `woman(X)`, `knows(Y,X)`, `man(Y)`, `son(Z,Y)`, and `daughter(Z,Y)`.

### **Exercise 1.4:**

**Q no:** Represent the following in Prolog:

1. Butch is a killer.
2. Mia and Marcellus are married.
3. Zed is dead.
4. Marcellus kills everyone who gives Mia a foot massage.
5. Mia loves everyone who is a good dancer.
6. Jules eats anything that is nutritious or tasty.

### **Ans:**



```
%lab task 3 and lab 4 ( sp19-bcs-042 ))) .pl
File Edit Browse Compile Prolog Pce Help
%lab task 3 and lab 4 ( sp19-bcs-042 ))) .pl

%EXERCISE 1.4

%QUESTION 4

%1.
killer(butch) .

%2.
married(mia,marcellus) .

%3.
dead(zed) .

%4.
kills(marcellus,X) :- footmassage(mia,X) .

%5.
loves(mia,X) :- good_dancer(X) .

%6.
eats(jules,X) :-
    nutritious(X) .
eats(jules,X) :-
    tasty(X) .
```

Line: 25

## Exercise 1.5:

**Q no:** Suppose we are working with the following knowledge base:

wizard(ron).

hasWand(harry).

quidditchPlayer(harry).

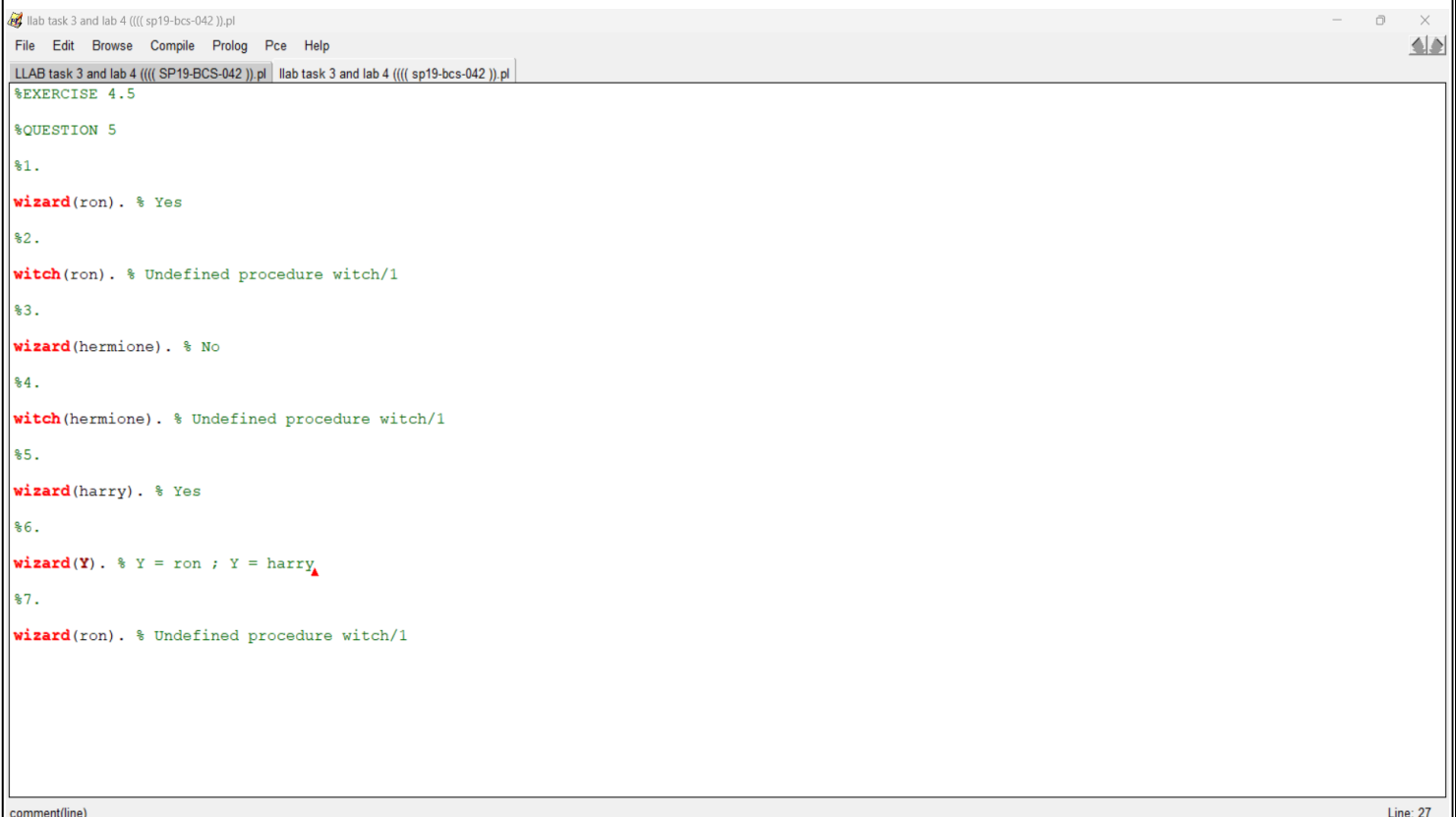
wizard(X) :- hasBroom(X),hasWand(X).

hasBroom(X) :- quidditchPlayer(X).

**How does Prolog respond to the following queries?**

1. wizard(ron).
2. witch(ron).
3. wizard(hermione).
4. witch(hermione).
5. wizard(harry).
6. wizard(Y).
7. witch(Y).

**Ans:**



The screenshot shows a Prolog IDE window titled "llab task 3 and lab 4 ((( sp19-bcs-042 ))).pl". The menu bar includes File, Edit, Browse, Compile, Prolog, Pce, and Help. The main text area contains the following code:

```
%EXERCISE 4.5
%QUESTION 5
%1.
wizard(ron). % Yes
%2.
witch(ron). % Undefined procedure witch/1
%3.
wizard(hermione). % No
%4.
witch(hermione). % Undefined procedure witch/1
%5.
wizard(harry). % Yes
%6.
wizard(Y). % Y = ron ; Y = harry
%7.
witch(ron). % Undefined procedure witch/1
```

At the bottom left, there is a "comment(line)" field. At the bottom right, it says "Line: 27".