

Submitted To : Ma'am Neha

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Course: B.Sc (hons.) Computer Science, III Year,
VI Semester

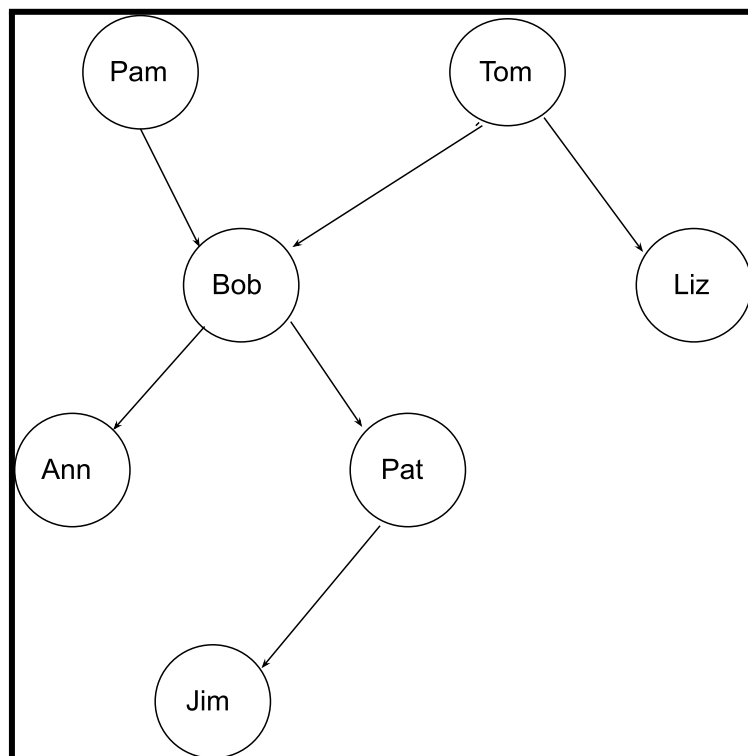
College Roll no. : CSC/21/55

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Practical file for Core Paper XIII: Artificial
Intelligence

PRACTICAL 1

FAMILY TREE



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PROLOG CODE

```
female(liz).
female(pat).
female(ann).
male(tom).
male(bob).
male(jim).

parent(pam, bob).
parent(tom, bob).
parent(tom, liz).
parent(bob, ann).
parent(bob, pat).
parent(pat, jim).

grandparent(X, Z) :-
    parent(X, Y),
    parent(Y, Z).

same_parent(X, Y) :-
    parent(Z, X),
    parent(Z, Y),
    X \= Y.

has_child(X) :-
    parent(X, _).

offspring(X, Y) :-
    parent(X, Y).

mother(X, Y) :-
    parent(X, Y),
    female(X).
```

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```
sister(X, Y) :-
    same_parent(X, Y),
    female(X).

happy(X) :-
    has_child(X).

hastwochildren(X) :-
    parent(X, Y),
    sister(Y, _).

grandchild(X, Z) :-
    parent(Y, X),
    parent(Z, Y).

aunt(X, Y) :-
    parent(Z, Y),
    sister(X, Z).

predecessor(X, Z) :-
    parent(X, Z).

predecessor(X, Z) :-
    parent(X, Y),
    predecessor(Y, Z).

% New relations
maternalgrandmother(X, Y) :-
    mother(X, Z),
    parent(Z, Y).

maternalgrandfather(X, Y) :-
    parent(X, Z),
```

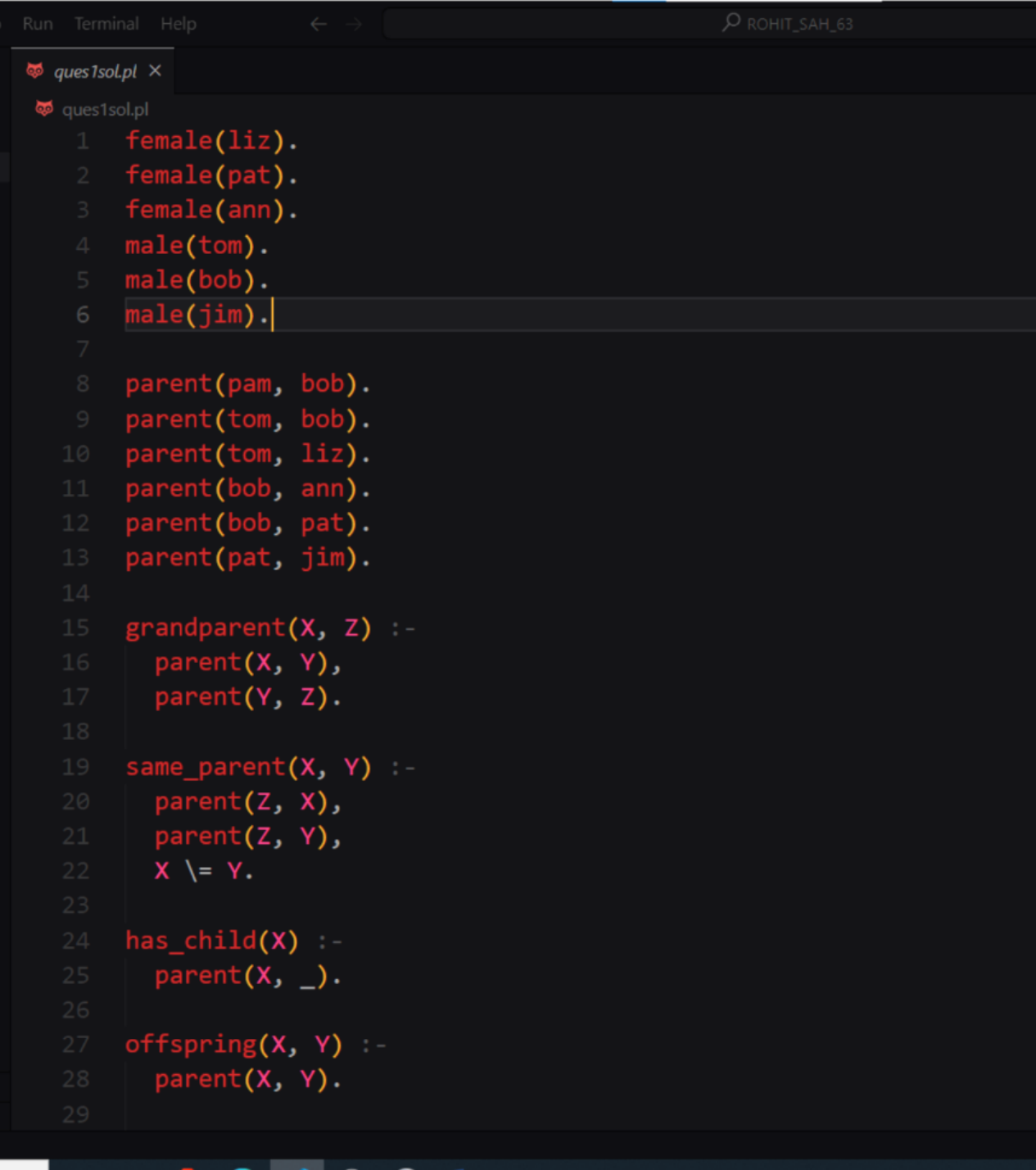
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```
mother(Z,Y),  
male(X).  
  
paternalgrandmother(X,Y) :-  
    mother(X,Z),  
    parent(Z,Y),  
    male(Z).  
  
paternalgrandfather(X,Y) :-  
    parent(X,Z),  
    parent(Z,Y),  
    male(X).
```

WINDOW SCREEN SHOT



```
Run Terminal Help  ← →  ROHIT_SAH_63
ques1sol.pl ×
ques1sol.pl
1  female(liz).
2  female(pat).
3  female(ann).
4  male(tom).
5  male(bob).
6  male(jim).
7
8  parent(pam, bob).
9  parent(tom, bob).
10 parent(tom, liz).
11 parent(bob, ann).
12 parent(bob, pat).
13 parent(pat, jim).
14
15 grandparent(X, Z) :-
16     parent(X, Y),
17     parent(Y, Z).
18
19 same_parent(X, Y) :-
20     parent(Z, X),
21     parent(Z, Y),
22     X \= Y.
23
24 has_child(X) :-
25     parent(X, _).
26
27 offspring(X, Y) :-
28     parent(X, Y).
29
```

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```
Run Terminal Help ← → ROHIT_SAH_63
ques1sol.pl X
ques1sol.pl
24 has_child(X) :-
25     parent(X, _).
26
27 offspring(X, Y) :-
28     parent(X, Y).
29
30 mother(X, Y) :-
31     parent(X, Y),
32     female(X).
33
34 sister(X, Y) :-
35     same_parent(X, Y),
36     female(X).
37
38 happy(X) :-
39     has_child(X).
40
41 hastwochildren(X) :-
42     parent(X, Y),
43     sister(Y, _).
44
45 grandchild(X, Z) :-
46     parent(Y, X),
47     parent(Z, Y).
48
49 aunt(X, Y) :-
50     parent(Z, Y),
51     sister(X, Z).
52
53 predecessor(X, Z) :-
54     parent(X, Z).
```

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PRACTICAL FILE - Core Paper XIII: Artificial Intelligence

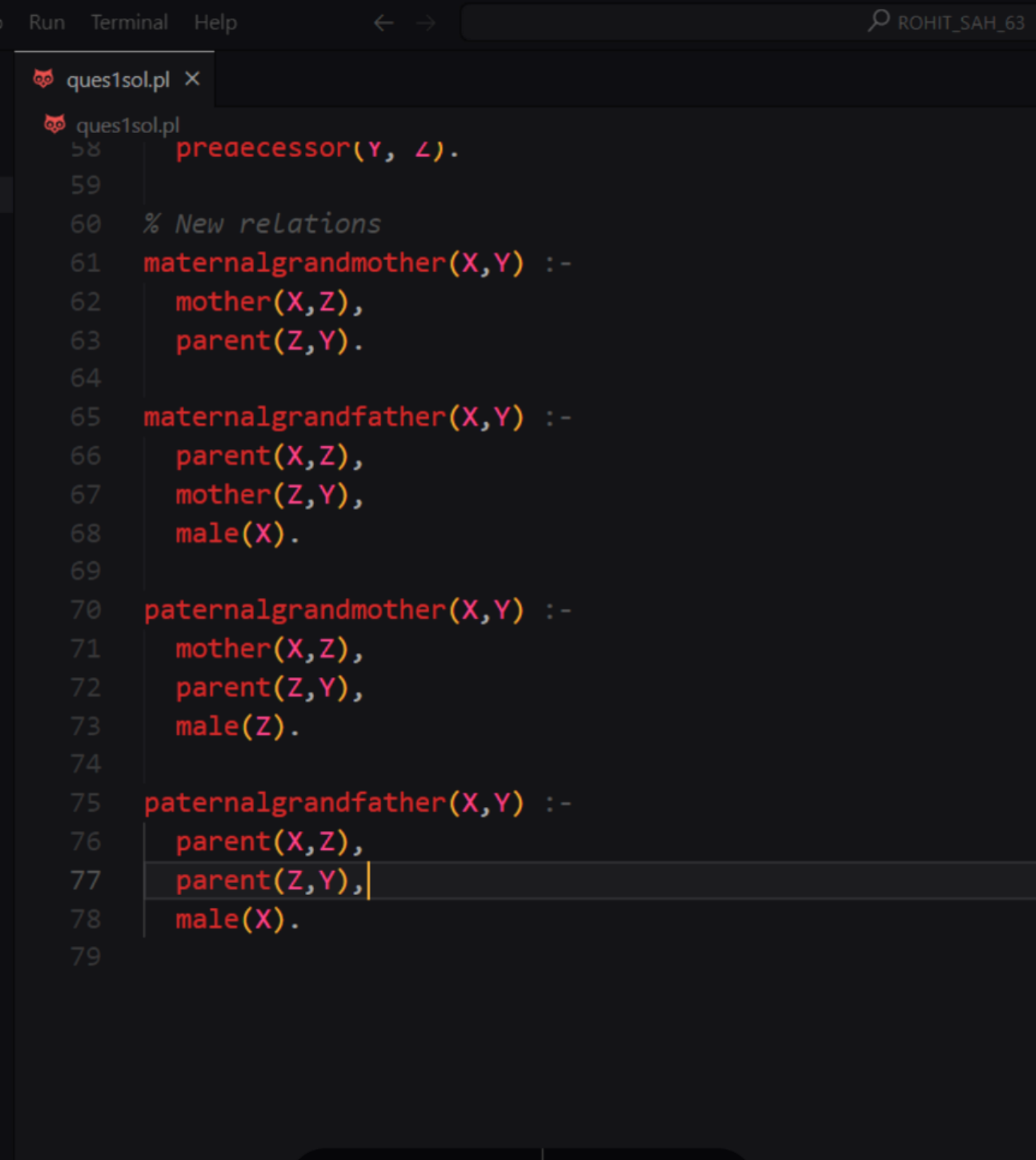


```
Run Terminal Help  ← → ROHIT_SAH_63
ques1sol.pl x
ques1sol.pl
39     has_child(X).
40
41     hastwochildren(X) :-
42         parent(X, Y),
43         sister(Y, _).
44
45     grandchild(X, Z) :-
46         parent(Y, X),
47         parent(Z, Y).
48
49     aunt(X, Y) :-
50         parent(Z, Y),
51         sister(X, Z).
52
53     predecessor(X, Z) :-
54         parent(X, Z).
55
56     predecessor(X, Z) :-
57         parent(X, Y),
58         predecessor(Y, Z).
59
```

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```
Run Terminal Help ROHIT_SAH_63
ques1sol.pl x
ques1sol.pl
58 predecessor(Y, Z).
59
60 % New relations
61 maternalgrandmother(X,Y) :-
62     mother(X,Z),
63     parent(Z,Y).
64
65 maternalgrandfather(X,Y) :-
66     parent(X,Z),
67     mother(Z,Y),
68     male(X).
69
70 paternalgrandmother(X,Y) :-
71     mother(X,Z),
72     parent(Z,Y),
73     male(Z).
74
75 paternalgrandfather(X,Y) :-
76     parent(X,Z),
77     parent(Z,Y),
78     male(X).
79
```

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QUERIES:

i) Who is Jim's parents? Assume this is some Y.

```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run
Welcome to SWI-Prolog (threaded, 64 bits, version 9.0.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- consult("ques01.pl").
true.

?- parent(jim,X).
false.

?- parent(Y,jim).
Y = pat.
```

ii) Who is the parent of X, of Ann.

```
?- parent(X,ann).
X = bob.
```

iii) Is this same X a parent of Pat?

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```
?- parent(pam,X),parent(X,pat).  
X = bob.
```

Who is Pat's parent?

```
?- parent(X, pat).  
X = bob.
```

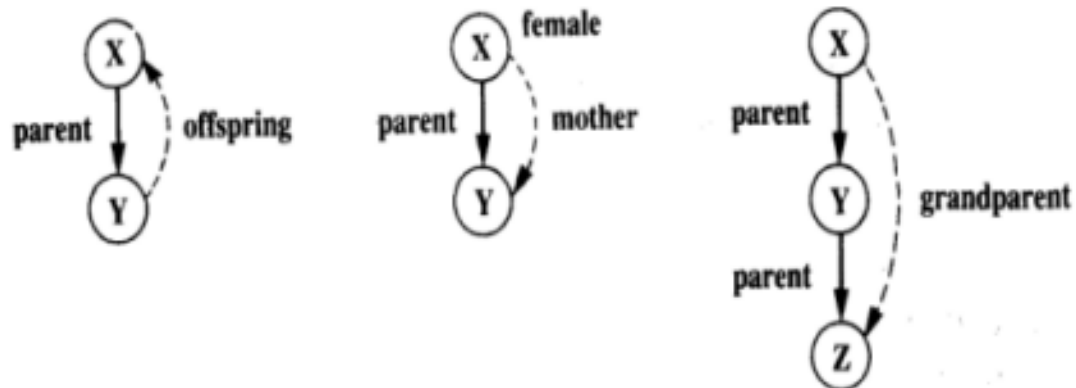
Does Liz have a child?

```
?- parent(liz,Y).  
false.  
  
?-
```

Who is pat's grandparent?

```
?- grandparent(X,pat).  
X = pam
```

Diagram Reference:



?- parent(pam,bob).
true.

?- mother(pam,bob).
false.

?- grandparent(pam,ann).
true.

?- grandparent(bob,jim).
true.

?- |

Diagram References:

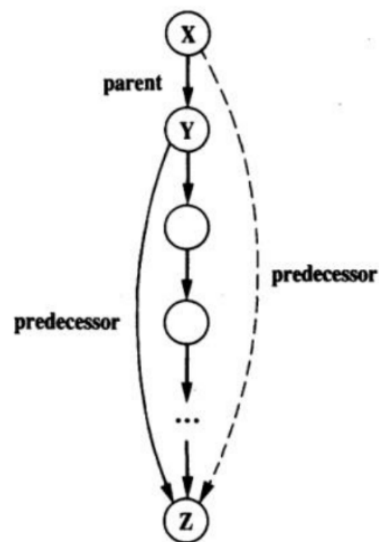


Figure 1.7 Recursive formulation of the predecessor relation.

RELATION DEFINED IN PROLOG


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```
53 predecessor(X, Z) :-  
54     parent(X, Z).  
55  
56 predecessor(X, Z) :-  
57     parent(X, Y),  
58     predecessor(Y, Z).  
59
```

PREDECESSOR QUERY

 SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)

File Edit Settings Run

Welcome to SWI-Prolog (threaded, 64 bits, version 9.0.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit <https://www.swi-prolog.org>
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- consult("ques1sol.pl").
true.

?- predecessor(tom,pat).
true |

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```
?- predecessor(tom,pat).  
true .  
  
?- predecessor(Y,pat).  
Y = bob |
```

Define the relations in terms of parent relation.

- (a) maternalgrandmother(X,Y)**
- (b) maternalgrandfather(X,Y)**
- (c) paternalgrandmother(X,Y)**
- (d) paternalgrandfather(X,Y)**

```
% New relations
maternalgrandmother(X,Y) :-
    mother(X,Z),
    parent(Z,Y).

maternalgrandfather(X,Y) :-
    parent(X,Z),
    mother(Z,Y),
    male(X).

paternalgrandmother(X,Y) :-
    mother(X,Z),
    parent(Z,Y),
    male(Z).

paternalgrandfather(X,Y) :-
    parent(X,Z),
    parent(Z,Y),
    male(X).
```