

# ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ

## 6<sup>ο</sup> Εξάμηνο

### - Άσκηση Πράξης 1 -

### Προσομοίωση απλών Ψηφιακών Κυκλωμάτων

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## Δημιουργία και εκτέλεση προγραμμάτων Prolog

The screenshot displays the SWI-Prolog environment. On the left, a Notepad++ window contains the following Prolog code:

```

1 parent(cronus,hestitia).
2 parent(cronus,hades).
3 parent(cronus,poseidon).
4 parent(cronus,zeus).
5 parent(cronus,demeter).
6 parent(rhea,hestitia).
7 parent(rhea,hades).
8 parent(rhea,poseidon).
9 parent(rhea,zeus).
10 parent(rhea,demeter).
11 parent(zeus,athena).
12 parent(zeus,ares).
13 parent(zeus,hebe).
14 parent(zeus,hephaestus).
15 parent(zeus,persephone).
16 parent(hera,athena).
17 parent(hera,ares).
18 parent(hera,hebe).
19 parent(hera,hephaestus).
20 parent(demeter,persephone).
21
22 male(cronus).
23 male(hades).
24 male(poseidon).
25 male(zeus).
26 male(ares).
27 male(hephaestus).
28
29 female(rhea).
30 female(hestitia).
31 female(hera).
32 female(demeter).
33 female(persephone).
34 female(athena).
35 female(hebe).
36
37 father(x,y):-male(x),parent(x,y).
38 mother(x,y):-female(x),parent(x,y).

```

On the right, the SWI-Prolog interface shows a 'Load file into Prolog' dialog box with the file 'olympos.pl' selected. The SWI-Prolog logo is also visible in the top right corner of the interface.

## Δημιουργία και εκτέλεση προγραμμάτων Prolog

```

C:\STAMATIS\DEMOS\COURSES\AI\AI_2021\AI_LP_2020\SWI-Prolog
File Edit Search View Encoding Language Settings Tools Macro Run Plugins
Window ?
1 parent(cronus, hestia).
2 parent(cronus, hades).
3 parent(cronus, poseidon).
4 parent(cronus, zeus).
5 parent(cronus, demeter).
6 parent(rhea, hestia).
7 parent(rhea, hades).
8 parent(rhea, poseidon).
9 parent(rhea, zeus).
10 parent(rhea, demeter).
11 parent(zeus, athena).
12 parent(zeus, ares).
13 parent(zeus, hebe).
14 parent(zeus, hephaestus).
15 parent(zeus, persephone).
16 parent(hera, athena).
17 parent(hera, ares).
18 parent(hera, hebe).
19 parent(hera, hephaestus).
20 parent(demeter, persephone).
21
22 male(cronus).
23 male(hades).
24 male(poseidon).
25 male(zeus).
26 male(ares).
27 male(hephaestus).
28
29 female(rhea).
30 female(hestia).
31 female(hera).
32 female(demeter).
33 female(persephone).
34 female(athena).
35 female(hebe).
36
37 father(X, Y):-male(X), parent(X, Y).
38 mother(X, Y):-female(X), parent(X, Y).
Ln:1 Col:1 Set:0:0 Windows (CR LF) UTF-8 INS

SWI-Prolog (Multi-threaded, version 6.6.6)
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (Multi-threaded, 32 bits, Version 6.6.6)
Copyright (c) 1990-2013 University of Amsterdam, VU Amsterdam
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software,
and you are welcome to redistribute it under certain conditions.
Please visit http://www.swi-prolog.org for details.

For help, use ?- help(Topic), or ?- apropos(Word).

1 ?-
% c:/STAMATIS/DEMOS/COURSES/AI/AI_2021/AI_LP_2020/SWI_Programs_2020/INTRODUC
0.02 sec, 39 clauses
1 ?-
| listing(male).
male(cronus).
male(hades).
male(poseidon).
male(zeus).
male(ares).
male(hebe).
male(hephaestus).
true.
2 ?- father(zeus, X).
X = athena ;
X = ares ;
X = hebe ;
X = hephaestus ;
X = persephone.
3 ?-

```

ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ

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## Υλοποίηση πύλης AND Prolog vs C/Java

/\* Κώδικας Prolog\*/

```

and(0,0,0).
and(0,1,0).
and(1,0,0).
and(1,1,1).

```

```

?- and(0,1,X).
?- and(X,1,0).
?- and(0,X,0).
?- and(X,Y,0).
?- and(X,Y,Z).

```

/\* Κώδικας C ή Java \*/

```

int and(int A, int B){
    int Y;
    if (A==1 && B==1) Y=1;
    else Y=0;
    return Y;
}

```

```

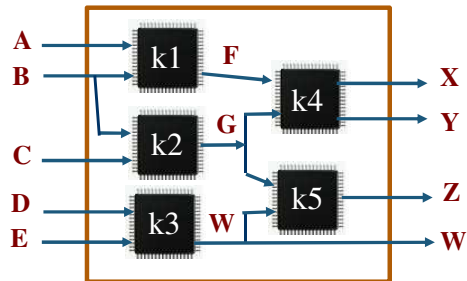
// Function call
int X = add(0,1);

```

ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ

6<sup>ο</sup> ΕΞΑΜΗΝΟ

### Υλοποίηση ψηφιακού κυκλώματος με χρήση κανόνων

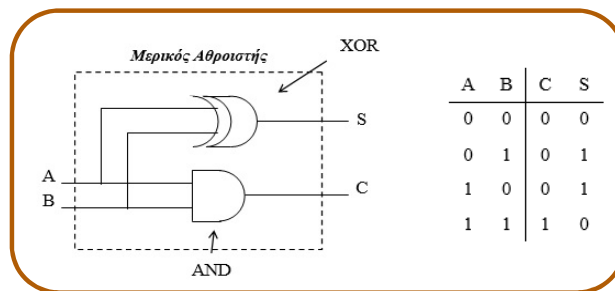


k\_new(A,B,C,D,E,X,Y,Z,W) :-  
 k1(A,B,F),  
 k2(B,C,G),  
 k3(D,E,W),  
 k4(F,G,X,Y),  
 k5(G,W,Z).

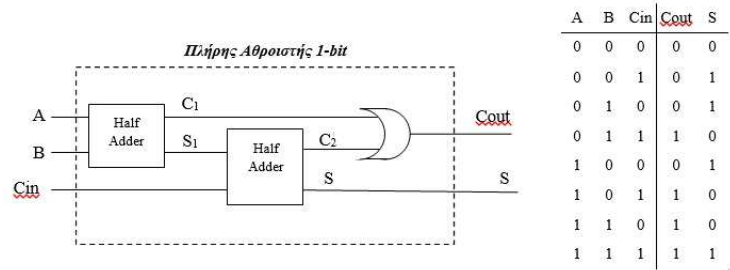
### Υλοποίηση Μερικού Αθροιστή

and(0,0,0).      or(0,0,0).      xor(0,0,0).  
 and(0,1,0).      or(0,1,1).      xor(0,1,1).  
 and(1,0,0).      or(1,0,1).      xor(1,0,1).  
 and(1,1,1).      or(1,1,1).      xor(1,1,0).

half\_adder(A,B,S,C) :-  
 and(A,B,C),  
 xor(A,B,S).



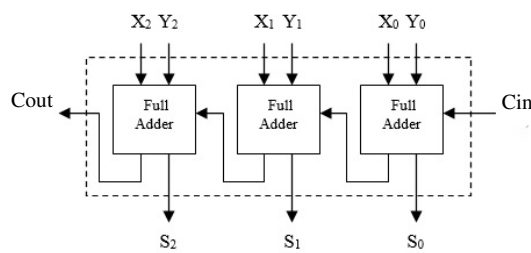
### Υλοποίηση Πλήρη Αθροιστή



```

full_adder(A,B,Cin,S,Cout) :-
    half_adder(A,B,S1,C1),
    half_adder(S1,Cin,S,C2),
    or(C1,C2,Cout).
    
```

### Υλοποίηση Αθροιστή 3 bits



```

threebit_adder(Cin,X2,X1,X0,Y2,Y1,Y0,Cout,S2,S1,S0) :-
    full_adder(X0,Y0,Cin,S0,Cout1),
    full_adder(X1,Y1,Cout1,S1,Cout2),
    full_adder(X2,Y2,Cout2,S2,Cout).
    
```



ΝΑ ΔΟΚΙΜΑΖΕΤΕ ΜΟΝΟΙ ΣΑΣ ΤΑ ΠΡΟΓΡΑΜΜΑΤΑ  
ΤΟΥ ΜΑΘΗΜΑΤΟΣ ΣΤΟΝ ΥΠΟΛΟΓΙΣΤΗ ΣΑΣ !!!

ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ

6<sup>ο</sup> ΕΞΑΜΗΝΟ