PRACTICAL NO. 03

A)HALF ADDER B) FULL ADDER C) 4-BIT ADDER D) 4-BIT ADDER SUBTRACTOR

1) NOT FILE

entity notf is

port(s1:in bit;sout:out bit);

end notf;

architecture dataflow of notf is

begin

sout<= not s1;

end dataflow;

2) AND FILE

entity andf is

port(x,y:in bit;z:out bit);

end andf;

architecture dataflow of andf is

begin

z<=x and y;

end dataflow;

3) OR FILE

entity orf is

port(a,b:in bit;c:out bit);

end orf;

architecture dataflow of orf is

begin

c<=a or b;

end dataflow;

4) XOR FILE

entity xorf is

port(q,w:in bit;e:out bit);

end xorf;

architecture dataflow of xorf is

begin

e<=q xor w;

end dataflow;

5) HALF ADDER

entity halfadd is

port(a1,b1:in bit; sum, carry :out bit);

end halfadd;

architecture struct of halfadd is

component andf

port(x,y:in bit;z:out bit);

end component;

component xorf

port(q,w:in bit;e:out bit);

end component;

begin

k0: xorf port map(a1,b1,sum);

k1: andf port map(a1,b1,carry);

end struct;

6) FULL ADDER

entity fulladd is

port(a2,b2,cin : in bit ; sum1, carry1: out bit);

end fulladd;

architecture struct of fulladd is

component halfadd

port(a1,b1:in bit; sum, carry :out bit);

end component;

component orf

port(a,b:in bit;c:out bit);

end component;

signal t0,t1,t2: bit;

begin

g0: halfadd port map (a2,b2,t0,t1);

g1: halfadd port map (t0,cin,sum1,t2);

g2: orf port map (t1,t2,carry1);

end struct;

7) 4-BIT ADDER

entity fourbitadder is

port(r0,r1,r2,r3,t0,t1,t2,t3,incarry0: in bit ; out0,out1,out2,out3,outcarry4: out bit);

end fourbitadder;

architecture struct of fourbitadder is

component fulladd

port(a2,b2,cin : in bit ; sum1, carry1: out bit);

end component;

signal j0,j1,j2: bit;

begin

new0: fulladd port map (r0,t0,incarry0,out0,j0);

new1: fulladd port map (r1,t1,j0,out1,j1);

new2: fulladd port map (r2,t2,j1,out2,j2);

new3: fulladd port map (r3,t3,j2,out3,outcarry4);

end struct;

8) 4-BIT ADDER SUBTRACTOR

entity fourbitaddsub is

port(f0,f1,f2,f3,j0,j1,j2,j3,mode: in bit ; out0n,out1n,out2n,out3n,outcarry5: out bit);

end fourbitaddsub;

architecture struct of fourbitaddsub is

component fourbitadder

port(r0,r1,r2,r3,t0,t1,t2,t3,incarry0: in bit ; out0,out1,out2,out3,outcarry4: out bit);

end component;

component xorf

port(q,w:in bit;e:out bit);

end component;

component notf

port(s1:in bit;sout:out bit);

end component;

component andf

port(x,y:in bit;z:out bit);

end component;

signal z0,z1,z2,z3,d0,d1,d2,d3,jk0,jk1,jk2,jk3,out\_new,out\_new1,not\_output,and\_output,zeroin,carryinput1,carryinput2: bit;

begin

ne0: xorf port map (mode,j0,d0);

ne1: xorf port map (mode,j1,d1);

ne2: xorf port map (mode,j2,d2);

ne3: xorf port map (mode,j3,d3);

ne4: fourbitadder port map (d0,d1,d2,d3,f0,f1,f2,f3,carryinput1,jk0,jk1,jk2,jk3,out\_new1);

ne5: notf port map (out\_new1,not\_output);

ne6: andf port map (mode,not\_output,and\_output);

ne7: xorf port map (and\_output,jk0,z0);

ne8: xorf port map (and\_output,jk1,z1);

ne9: xorf port map (and\_output,jk2,z2);

ne10: xorf port map (and\_output,jk3,z3);

ne11: fourbitadder port map (z0,z1,z2,z3,and\_output,zeroin,zeroin,zeroin,carryinput2,out0n,out1n,out2n,out3n,outcarry5);

end struct;