ACOL 215 (24 Sept.)

Exercise Find the prime implicants of

$$F(w,x,y,z) = \Sigma(0,2,4,5,6,7,8,10,13,14,15)$$

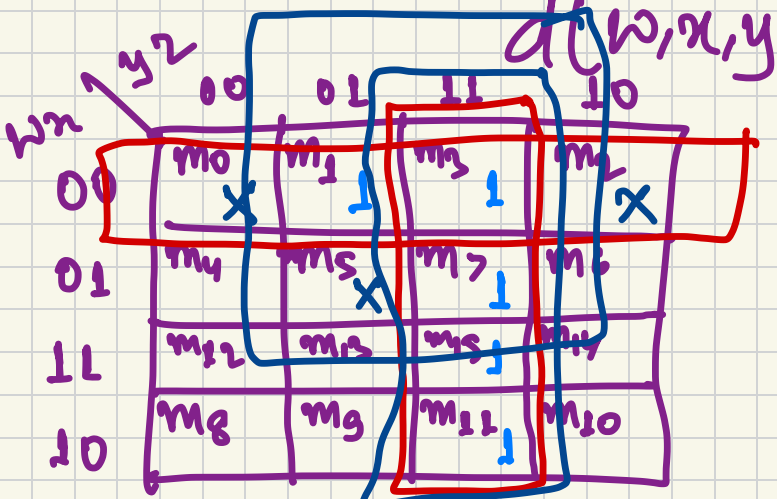
Don't care conditions

Simplify the Boolean function

$$f(w,x,y,z) = \sum(1,3,7,11,15)$$

which has don't care conditions

$$d(w,x,y,z) = \sum(0,2,5)$$



$yz + w'x'$

$y\bar{z} + w'z$

Simplify $F(w,x,y,z) = \sum(4,5,6,7,12)$

with $d(w,x,y,z) = \sum(0,8,13)$

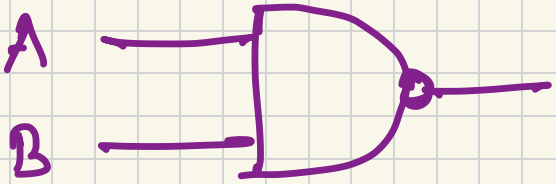
Ans $y'z' + w'x$ (check)

NAND and NOR implementation

Digital circuits are frequently constructed with NAND and NOR gates.

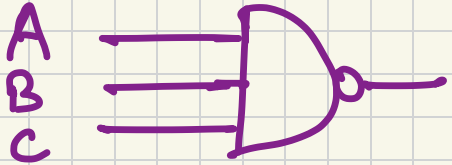
Why? Easier to fabricate with electronic components.

NAND



(A NAND B)

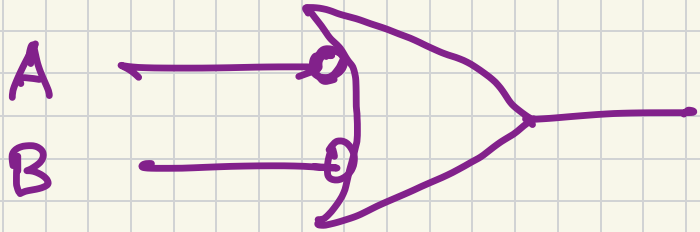
NOT (A AND B)



$(ABC)'$

AND-invert

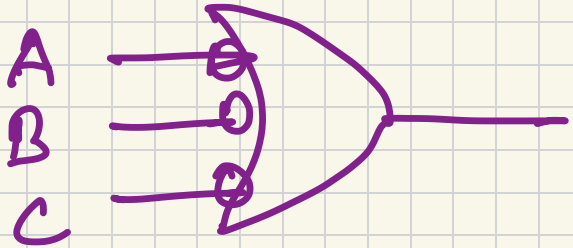
Other graphical representation



NOT A OR NOT B

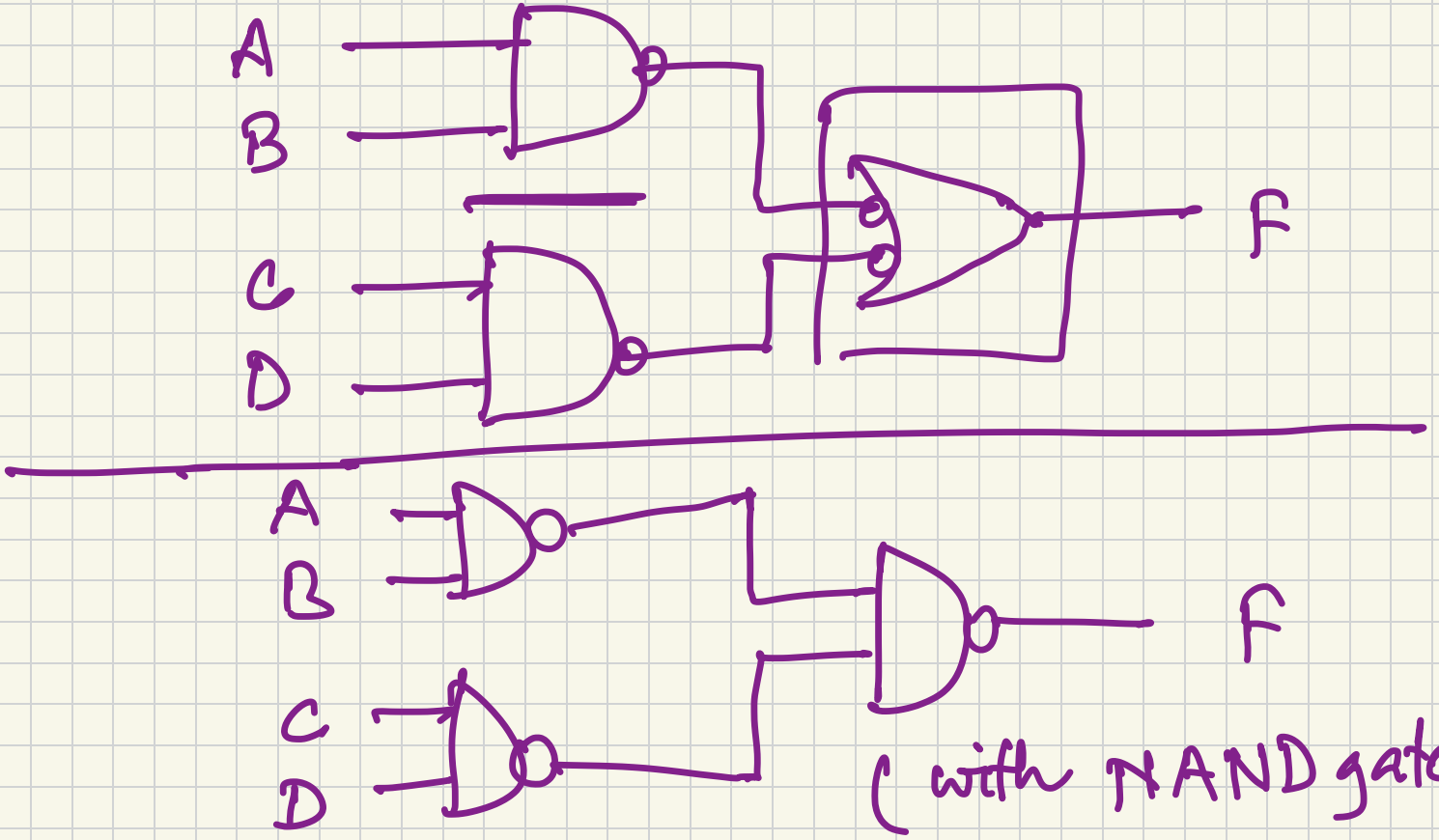
NOT (A AND B)

A NAND B



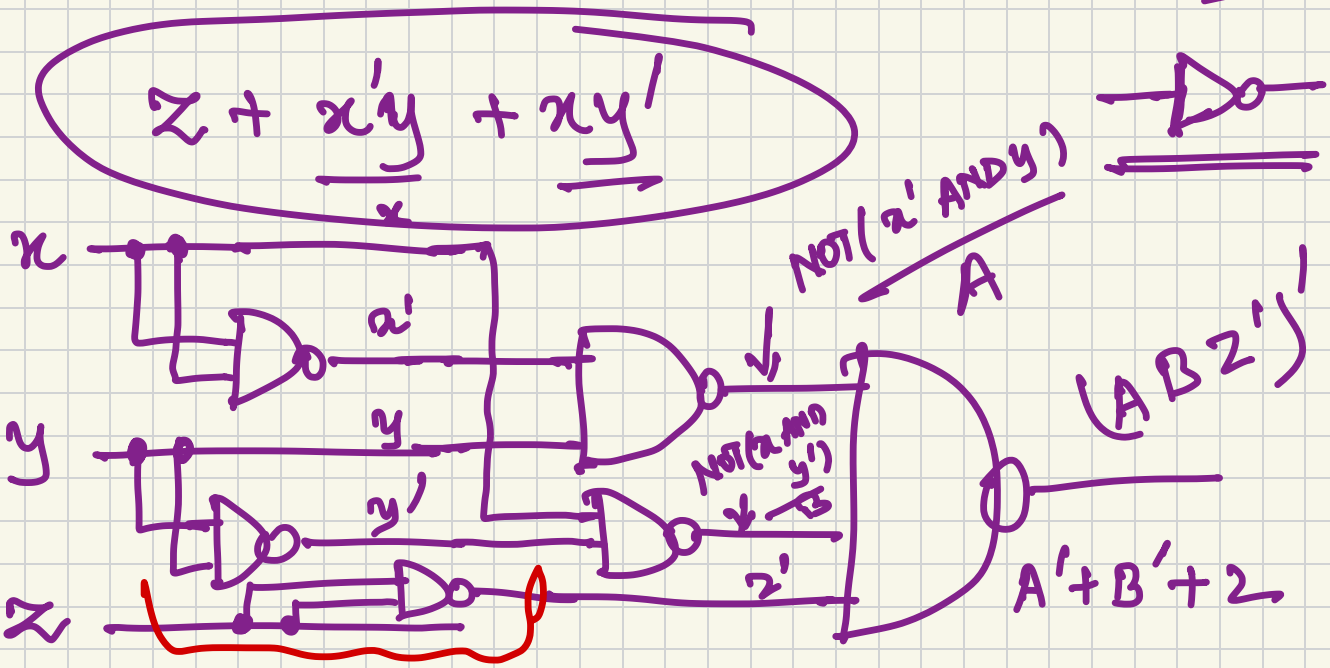
Invert - OR

$F = AB + CD$



Exercise Implement the following with NAND gates.

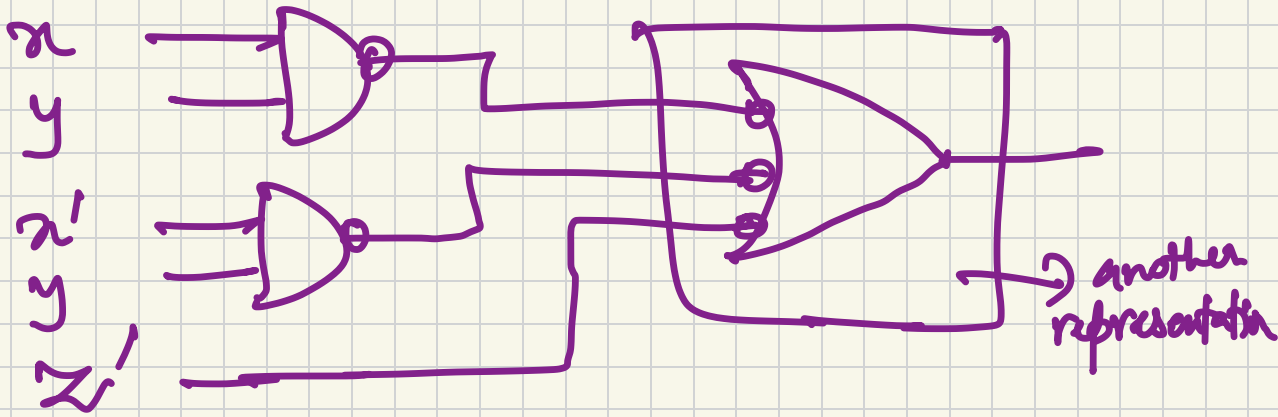
$$F(x,y,z) = \sum (1,2,3,4,5,7)$$



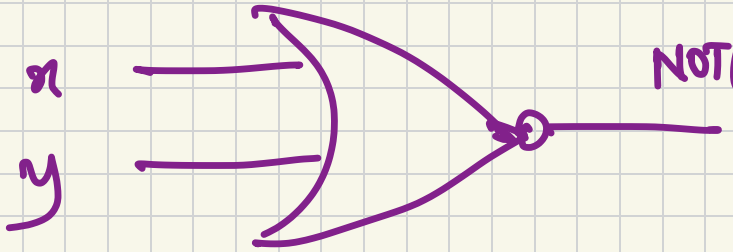
Exercise

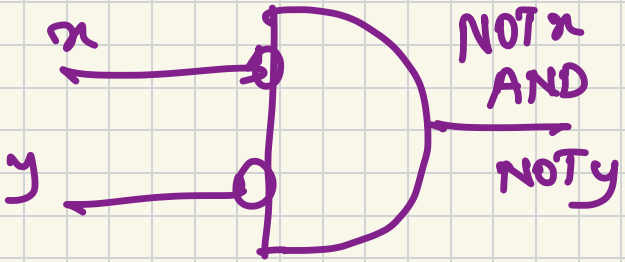
Implement $F(x,y,z) = \sum(0,1,3,5,6,7)$ with NAND gates.

$F = z + x'y' + xy$

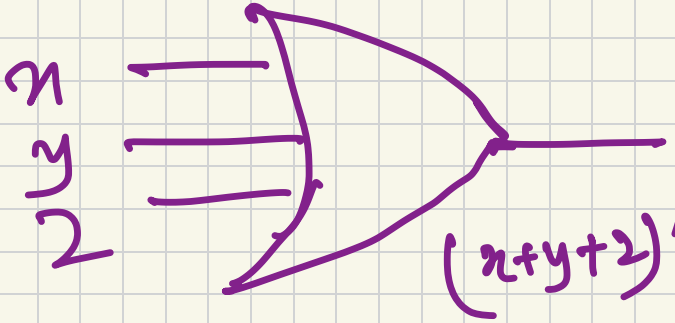


NOR implementation

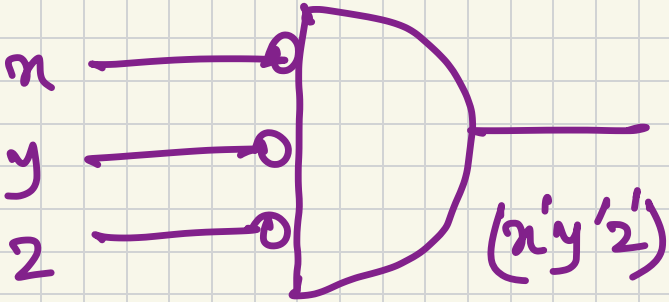




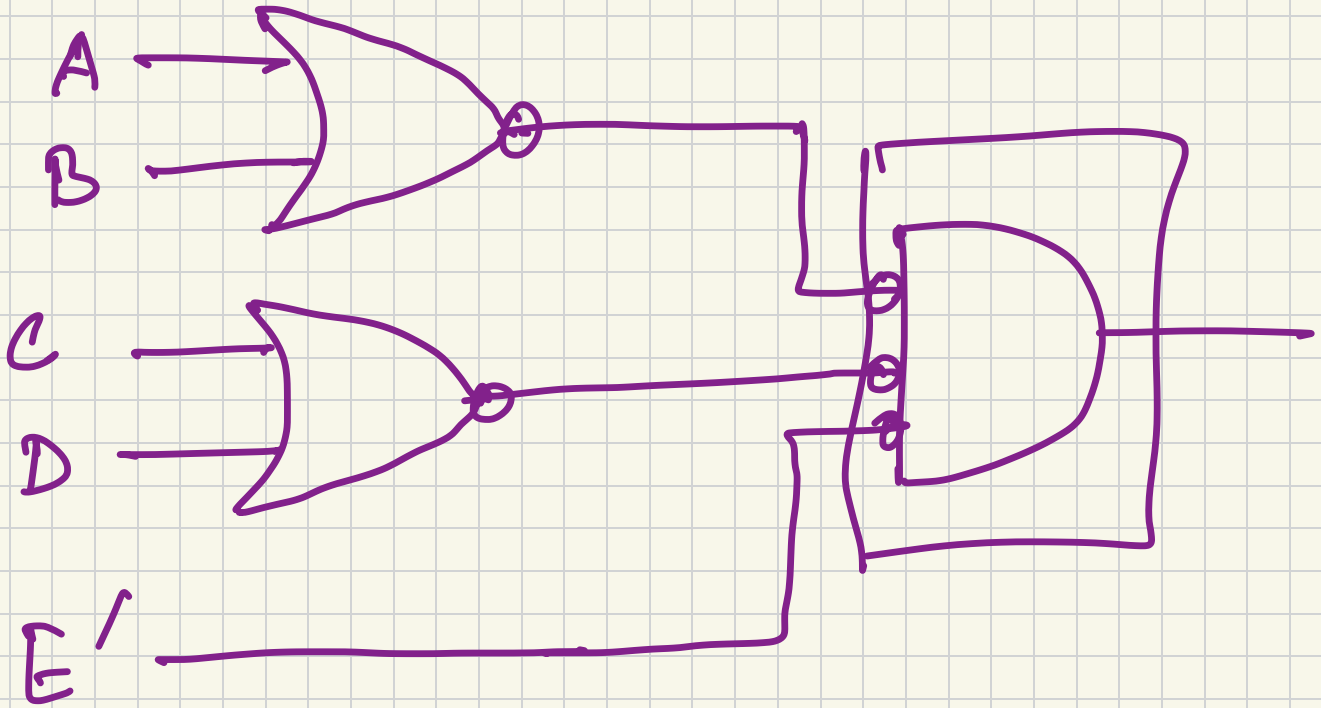
OR - invert



invert - AND



Example $F = (A+B)(C+D)E$

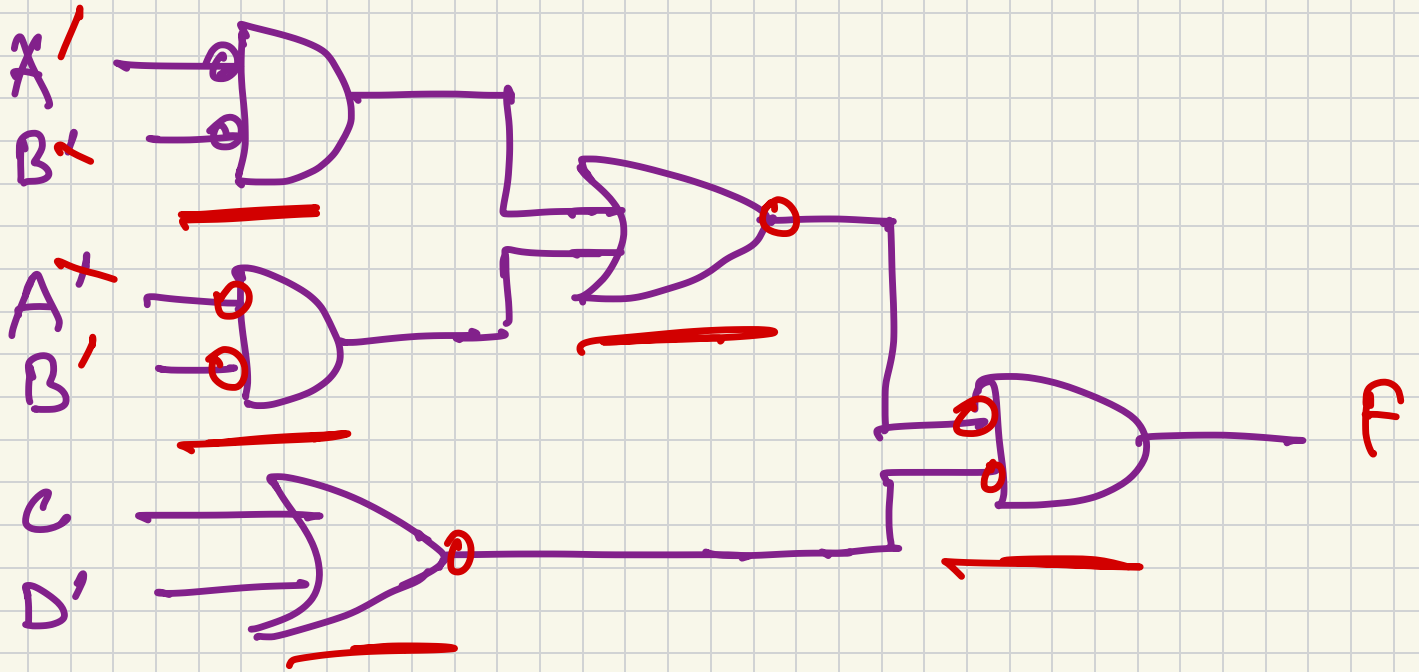


Exercise

Implement

$$f = (AB' + A'B)(C + D')$$

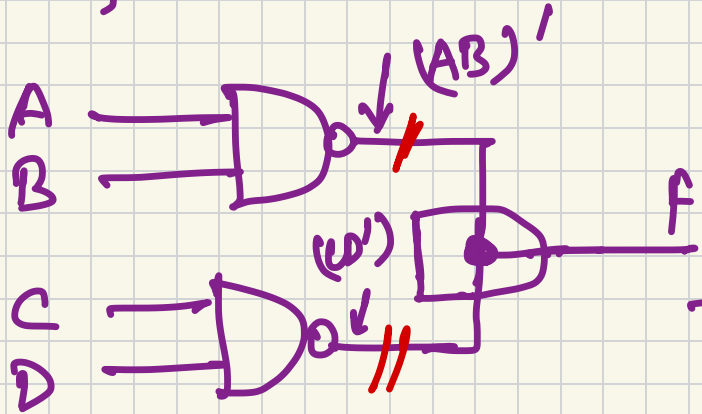
with NOR gates.



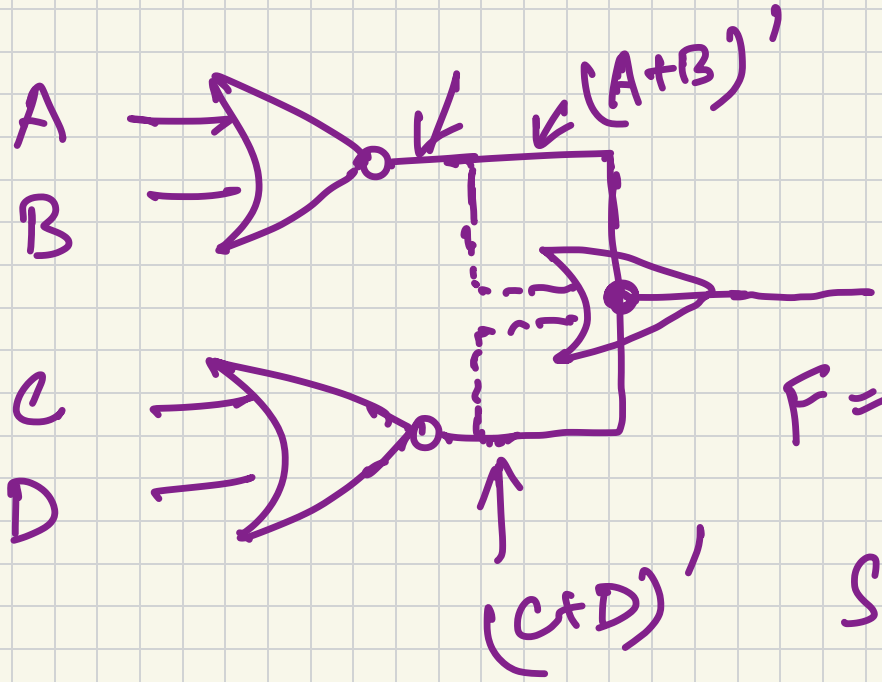
Two-level implementation

TTL

Some NAND and NOR gates allow a wired connection between the outputs of two gates to implement a specific logic function (wired logic).



AND-OR-Invert function



$F = (A+B)' + (C+D)'$

Some NOR gates in ECL

OR-AND-Invert function