

Rtqdrigo u Solutions /EE

- Q1. We need to design a full subtractor which computes $a - b - c$, where c is the borrow from the next less significant digit that produces a difference, d , and a borrow from the next more significant bit, p .

a) Give the truth table for the full subtractor.

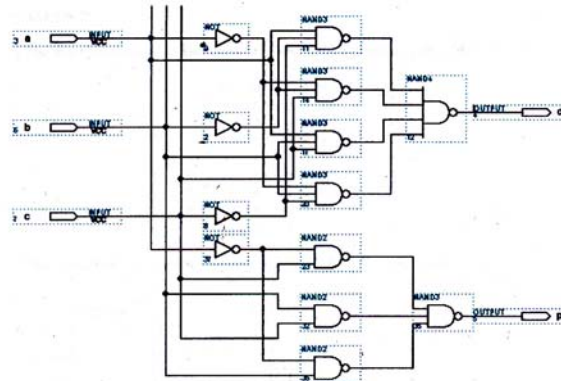
(5)

a	b	c	p	d
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

b) Implement the circuit using only NAND gates and inverters.

(5)

$d = [(ab'c')' (a'bc')' (a'b'c)' (abc)']'$ and
 $p = [(a'b)' (a'c)' (bc)']'$



(Figure courtesy of Dominique Bruneau and Martin Charrette)

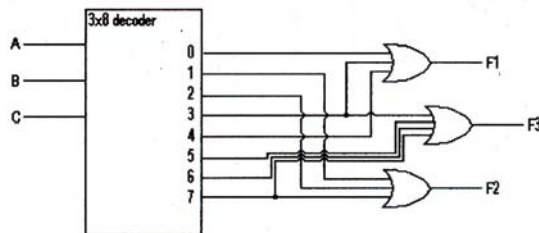
- Q2. a) Implement, with a decoder and external OR gates, the combinational circuit specified by the following three Boolean functions:

(5)

$$f_1(A, B, C) = \sum m(0, 3, 4)$$

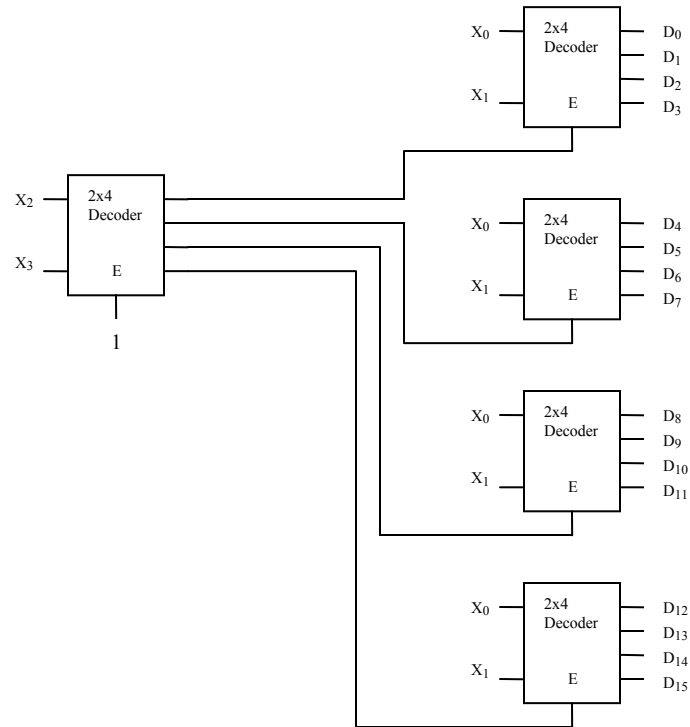
$$f_2(A, B, C) = \sum m(1, 2, 7)$$

$$f_3(A, B, C) = \prod M(0, 1, 2, 4)$$



(Figure courtesy of Dominique Bruneau and Martin Charrette)

- b) Design a 4-to-16 line decoder with *Enable* input using five 2-to-4 line decoders with *Enable* inputs. (5)



- Q3. a) Implement the following Boolean function with an 8-to-1 line multiplexer and a single inverter with variable B as an input. (5)

$$f(A, B, C, D) = \sum m(2, 4, 6, 9, 10, 11, 15)$$

