COE 202, Term 131

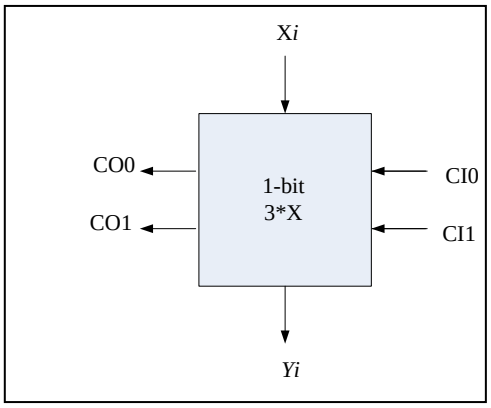
Digital Logic Design

Assignment# 1 Solution

Due date: Tuesday, Nov. 12

Q.1. It is required to design a combinational circuit that computes the equation Y=3*X, where X is an n-bit unsigned number.

(i) Design the circuit as a modular circuit where each module receives a single bit of the input, X_i.

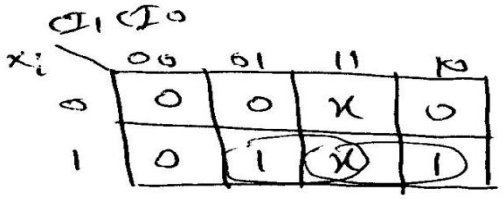


(ii) Derive the truth table of your 1-bit module in (i).

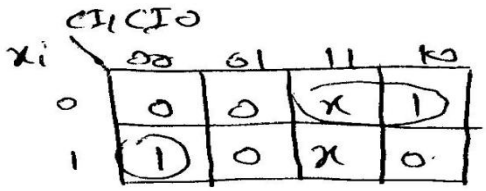
Truth Table:

x_i	CI_1	CI_0	CO_1	CO_0	y_i
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	0
0	1	1	x	x	x
1	0	0	0	1	1
1	0	1	1	0	0
1	1	0	1	0	1
1	1	1	x	x	x

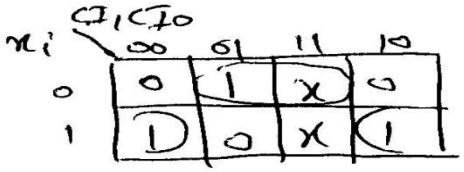
(iii) Derive minimized two-level sum-of-product equations for your 1-bit module circuit.



$$CO_1 = x_i CI_1 + x_i CI_0$$

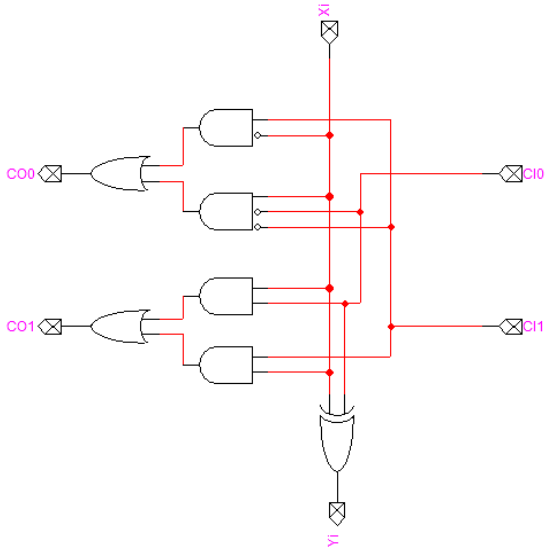


$$CO_0 = \overline{x_i} CI_1 + x_i \overline{CI_1}\ \overline{CI_0}$$

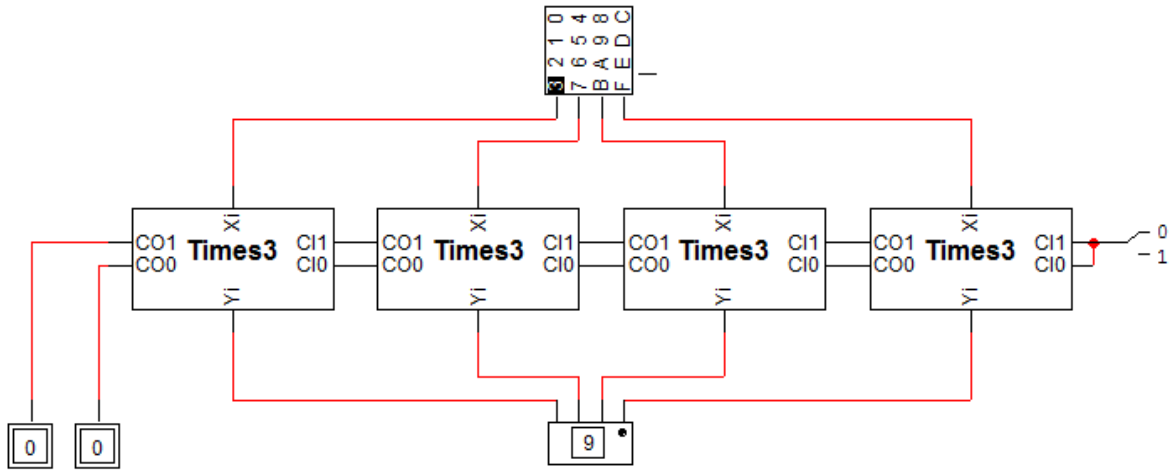


$$y_i = \overline{x_i} CI_0 + x_i \overline{CI_0}$$

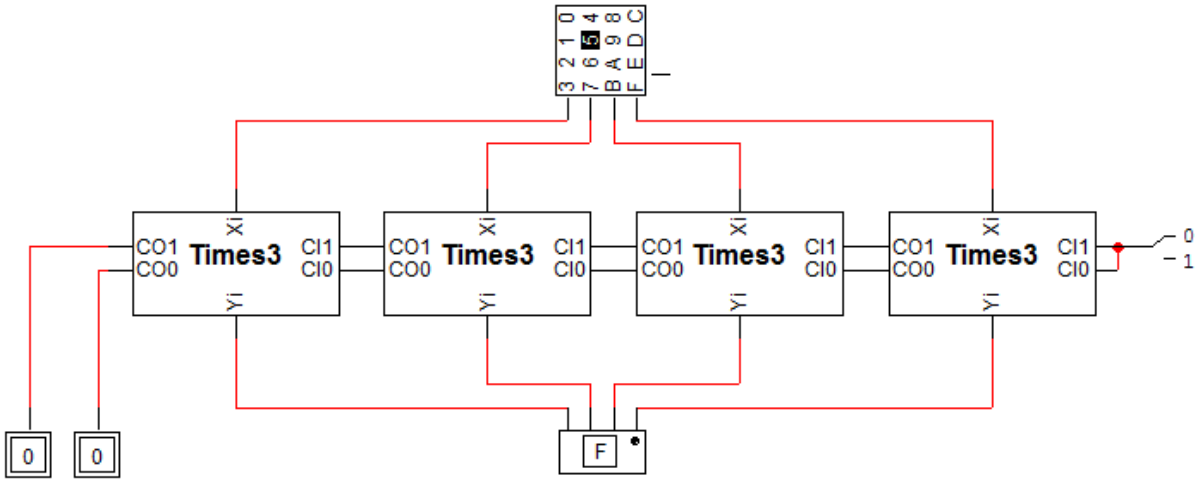
(iv) Verify the correctness of your design by modeling and simulating a 4-bit circuit using LogicWorks.



3*3=9



5*3=15



11*3=33