CS 4341.007 Digital Logic & Computer Design

Homework # 3

Due Date 9/28

Q1 Simplify each of the following Boolean equations. Sketch a reasonably simple combinational circuit implementing the simplified equation. 20%

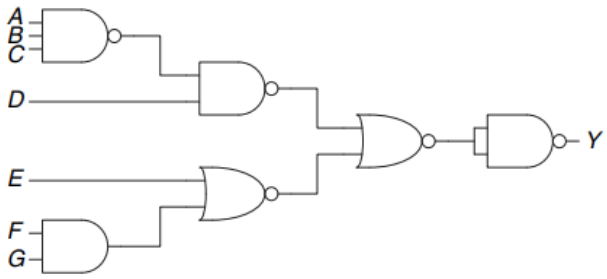
(a) $Y = BC + \overline{A}\,\overline{B}\,\overline{C} + B\overline{C}$

(b) $Y = \overline{A + \overline{A}B + \overline{A}\,\overline{B}} + \overline{A + \overline{B}}$

(c) $Y = ABC + ABD + ABE + ACD + ACE + (\overline{A + D + E}) + \overline{B}\,\overline{C}D + \overline{B}\,\overline{C}E + \overline{B}\,\overline{D}\,\overline{E} + \overline{C}\,\overline{D}\,\overline{E}$

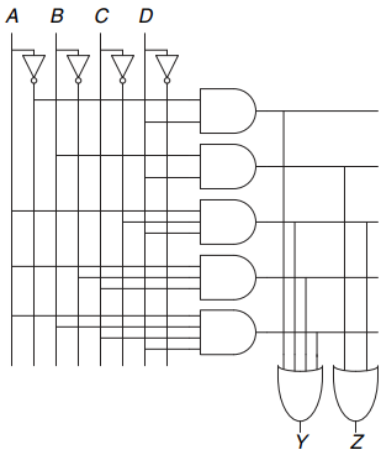
Q2 Prove De Morgan's Theorem (T12) for three variables, B2, B1, B0, using perfect induction. 20%

Q3 Using De Morgan equivalent gates and bubble pushing methods, redraw the circuit in below Figure so that you can find the Boolean equation by inspection. Write the Boolean equation. 20%



Q4 A circuit has four inputs and two outputs. The inputs A3:0 represent a number from 0 to 15. Output P should be TRUE if the number is prime (0 and 1 are not prime, but 2, 3, 5, and so on, are prime). Output D should be TRUE if the number is divisible by 3. Give simplified Boolean equations for each output and sketch a circuit. 20%

Q5 Write Boolean equations for the circuit in Figure below and minimize the equations using K-map. Sketch an improved circuit with the same function. 20%


A
B
C
D
Y
Z