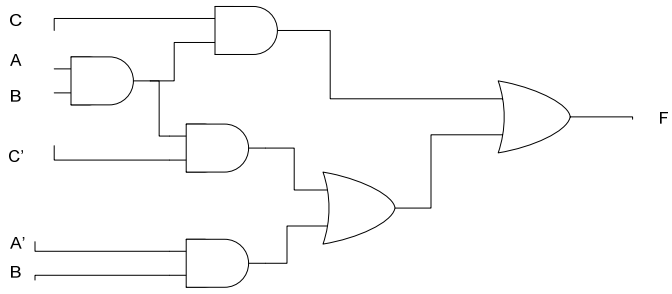
Course: Digital Systems Design		Course Number: COEN312/1	Section: CC
Examination: Midterm	Date: July 18, 2009	Time: 1 hour 10 min.	# of pages: 1
Instructor: Dr. M.R. Soleymani			
Books and Material: Only one crib sheet allowed, no calculator allowed.			
Special Instructions: Try all questions.			

1) Using Boolean Algebra minimize:

$$F = w'x(z'+y'z) + x(w + w'yz). \qquad \text{(3 Marks)}$$

2) For the following circuit,
   a. Draw the truth table (3 Marks).
   b. Simplify the logic using K-map (3 Marks).



3) Simplify the function F with the don't care condition d:

$$F(w, x, y, z) = \sum(0,2,5,7,8,10,13,15)$$

$$d(w, x, y, z) = \sum(1,6,14). \qquad \text{(3 Marks)}$$

4) Express the complement of $F(x, y, z) = \sum(2,5,6)$
   a. In sum-of-minterms form (2 Marks).
   b. In product of maxterms form (2 Marks).
5) Design (with minimum number of gates) a circuit with four inputs A, B, C and D and an output F such that F is equal to 1 if the number represented by ABCD is divisible by 3 or 4 (or both). (4 Marks).
6) Implement:

$$F = (x + y)(x' + z)(y + z')$$

   a) with OR, AND and NOT gates (1 Marks).
   b) With NOR gates only (2 Marks).
   c) With NAND gates only (2 Marks).