0907231 Digital Logic	First Exam	Fall 2015
5 Problems, 3 Pages	70 Minutes	November 11, 3:00 PM
الشعبة:	الرقم الجامعي: 0140754	الاسم :

11-12

Problem 1. Solve the following short problems. **(8 points)** 7

10×16+5

a) $(A5)_{16}$ is equal to (165 ✓)$_{10}$

b) $(0.712)_8$ is equal to (.E5 ✓)$_{16}$

.111001010

c) $(1001\,0110)_{BCD}$ is equal to (→ 1100000 ✓)$_2$

96

96 64 32 | 1 6 | 1 5 | 0 4 | 0 3 | 0 2 | 0 1 | 0 0

d) Given a binary code with 3-bit in the integer part and 2-bit in the fraction part, the maximum number of elements that can be represented using this code is .....32..... ✓

e) Assume N is a 3-digit number represented in hexadecimal. The minimum number of digits needed when representing N in BCD is .....~~3 digit~~ 12 digits..... ✗

f) Given $F(A,B,C) = (A+B)(\bar{C}+\bar{A}B)$. Determine $\bar{F}(A,B,C) = \sum_m(0,1,5,7)$ ✓

$\bar{F}$ = ~~$\bar{A}\bar{B} + A\bar{C}B(AC+AB)$~~

g) Given $F(A,B,C) = A + B(A+C) + \bar{A}B$. The simplest SOP form of F is .....A+B..... ✓

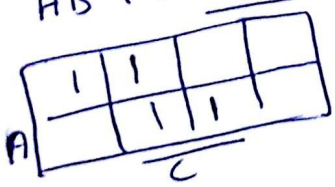
h) Given $F(A,B,C) = \sum_m(1,4,5)$. The simplest POS form of F is .....$\bar{B}(A+C)$..... ✓

f)

$\bar{F} = (A+B)(\bar{C}+\bar{A}B)$

$\bar{A}\bar{B} + C(A+\bar{B})$

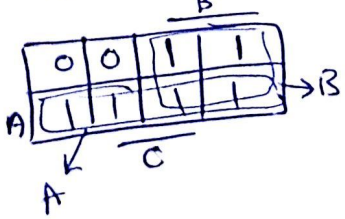
$\bar{F} = \bar{A}\bar{B} + AC + \bar{B}C$



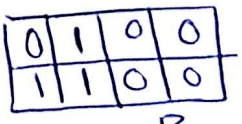
g)

$A + AB + BC + \bar{A}B$

$A + BC + \bar{A}B$



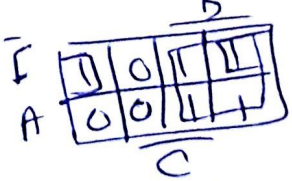
F



$A\bar{B} + \bar{B}C$

$\bar{B}(A+C)$

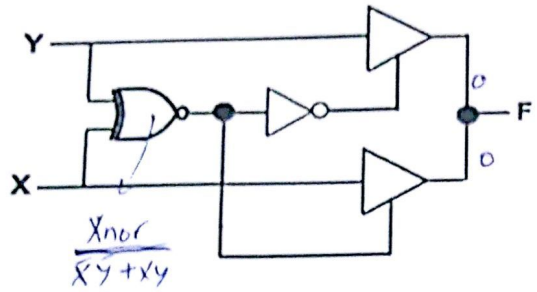
$\bar{F}$



$\bar{F} = B + \bar{A}\bar{C}$

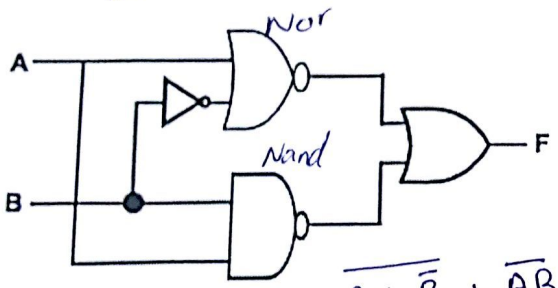
$F = \bar{B}(A+C)$

Problem 2. Write the truth table for the following circuits **(4 points)**



X	Y	F
0	0	0
0	1	0
1	0	0
1	1	1

$Z =$

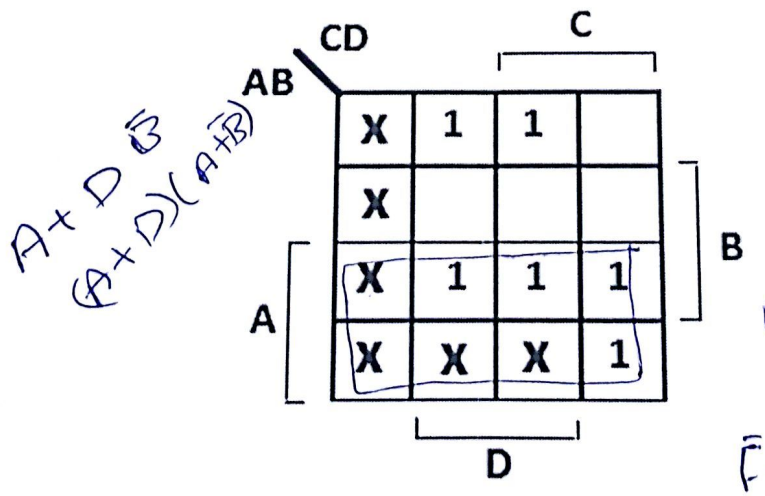


$\overline{A + \bar{B}} + \bar{A}B = F$

A	B	F
0	0	1
0	1	1
1	0	1
1	1	0

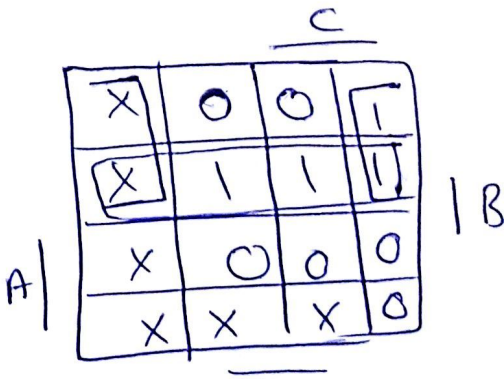
$\overline{0+1}$ $0+1$

Problem 3: Given the K-map of $F(A, B, C, D)$, write the optimized Boolean expression of F as a Product of Sums (PoS). **(2 points)**



$A + D\bar{B}$

$(A+D)(A+\bar{B})$



$\bar{F} = \bar{A}\bar{D} + \bar{A}B$

$F = (A+D)(A+\bar{B})$

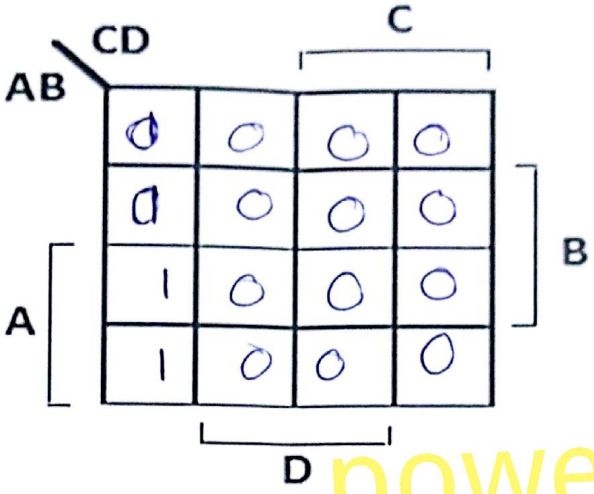
F(A,B,C,D)= $(A+D)(A+\bar{B})$

Problem 4: Given the following function F: (3 points)

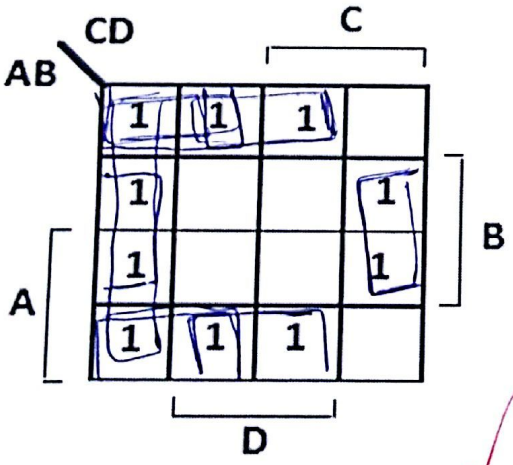
$$F(A,B,C,D) = (\bar{A} + C + \bar{D}).(\bar{A} + \bar{C}).A$$

a. What is the gate-input cost, with invertors counted (GN), of F? 11

b. Fill-in the K-map of F.



Problem 5: Consider the following k-map for the function F(A, B, C, D). Identify the expressions of all its prime implicants and determine which are essential. **(3 points)**



Prime Implicant Expression	Is it Essential?
$B\bar{D}$	Yes
$\bar{B}D$	Yes
$\bar{C}\bar{D}$	No
$\bar{C}\bar{B}$	No