KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 200 DIGITAL LOGIC CIRCUIT DESIGN

EXAMINATION I

October 24, 2007

NAME :					
I.D. # :					
SECTION :	**1**	**2**	**3**	**4**	**5**

PROBLEM #	SCORE	MAXIMUM
1.		25
2.		25
3.		25
4.		25
TOTAL		100

Q.# 1)

a. Convert the following octal number $(751.4)_8$ to decimal, binary and hexadecimal.
b. Determine the value of the base x, such that $(204)_x = (114)_8$.
c. Perform the following **binary** arithmetic operations:
   1) 11110.11 + 110.1
   2) 101101 x 1011
d. A 16 bit register has the state : 1001011101100101. What is the decimal number in the register if it represents:
   1) BCD code 2) Excess-3 code 3) 84-2-1 code

Q # 2)

a. Perform the following arithmetic operation in binary using the signed 2's complement representation for negative numbers. Use 8 bits to represent each number.

(-125) + (+72)

b. Simplify the following Boolean expressions to a minimum number of literals.

1. $F(x, y, z) = x'y'z' + x'y'z + x'yz' + xy'z' + xy'z + xyz'$
2. $F(w, x, y, z) = w'x'yz + wxy + w'y' + xy' + x'y'$

Q # 3)

For the following Boolean function:

$$F(A,B,C,D)=\left[\left(A+D'\right)\cdot\left(B'+C\right)\right]'+\left[(C+D)\cdot\left(AC'+B'(D'+C)\right)\right]'+\left(A'+B\right)'\cdot C'D$$

a. Express F as a sum of Minterms.
b. Express F as a product of Maxterms.
c. Simplify F in sum of products (SOP) form using K-map.

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Q # 4)

Consider the 2's complement operation on unsigned 4-bit binary numbers.

a. Prepare a truth table for the conversion of unsigned 4-bit binary numbers to their 2's complement equivalent. Use for the input side the symbols $A=A_3A_2A_1A_0$, and for the output side the symbols $T= T_3T_2T_1T_0$.
b. Using k-maps, give the minimal expression for each of the outputs in part (1).
c. Draw the complete circuit using random logic.