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ITI1100- Exam -previous

Question 1: (4 + 16 = 20 points)

- (a) Perform the following arithmetic operations using non signed numbers representation.

$$(1011.01)_2 - (11101.11)_2$$

(Show the carry after each addition of two digits)

- (b) Convert $A = (12.5)_{10}$ and $B = (1.40)_{16}$ into binary format employing 7 bits for the integer part and 3 for the fractional part, including the sign bit. Perform the following operations in specific signed complement as indicated for each operation.

- | | |
|-------------------|--|
| (i) $C = -A - B$ | using signed 1's complement |
| (ii) $D = -A + B$ | using signed 2's complement |
| (iii) $E = A - B$ | using 9's complement (show all intermediate steps) |

Important note: *Explain clearly your solution! Please note that if you give directly the result of the conversion of the two numbers (A and B), without explaining the conversion method you have used, your mark for this part of the question will be zero!*

Question 2: (20+ 10 = 30 points)

Part A: Design a combinational circuit that generates the 10's complement of a BCD (Binary Coded Decimal) digit.

- (i) Built the truth table of your circuit
(ii) Simplify the outputs in their sum of products form using K-map (assume unused combinations to be "don't care").

- a- List all prime implicants
b- List essential prime implicants

- (iii) Draw your circuit with NAND gates only (Assume NAND gates with any number of inputs are available).

Part-B: Given the following Boolean functions

(from "EXAM 1 PAGE 1" on dropbox)

$$F(a,b,c) = \sum m(0,2,3,7)$$

$$G(a,b,c) = \sum m(1,4,6,7)$$