THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 04
OPEN BOOK TEST: 2011
CSU2178: DIGITAL COMPUTER FUNDAMENTALS
DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 03rd March, 2011   Time: 4.00 pm – 5.30 pm
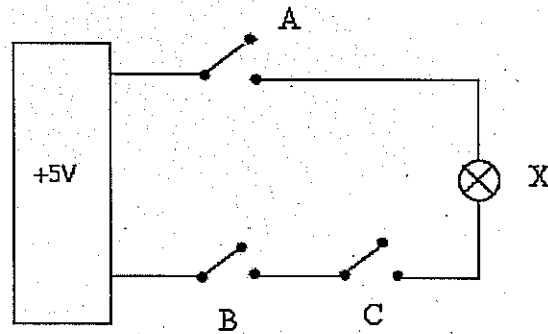
Answer THREE Questions ONLY.

Q1.

a. Prove De Morgan's theorem for a two variable case.

b. What are the input combinations for this circuit?

c. Draw the truth table for the following circuit.

d. Briefly describe the principle of duality for the Commutative property of Boolean algebra.

e. Consider following Truth table;

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

    i. Obtain the Boolean expression for the above truth table.

    ii. What is the Sum of Product term for this truth table?

    iii. Find the Product of Sum for of the Boolean expression.

Q2.

  a. Mention two advantages of Boolean expression minimization.

  b. Simplify the following Boolean expression.

$$\overline{A}(A+B)+(B+AA)(A+\overline{B})$$

    i. Using Boolean Algebraic rules
    ii. K-Map method

  c. Draw the Block diagram for the above simplified expression.

  d. What is the complexity of the circuit above?

  e. Write two reasons for using K-Map method for Boolean expression simplification.

Q3.

  a. Why do we need *"Data Representation"*?

  b. Give an example for fixed point number system with the range and the precision and prove whether Associative law is correct for that number system.

  c. Convert 65.075 into following bases;
    i. Base 2
    ii. Base 8
    iii. Base 12

  d. Consider +014 and -014 decimal values and find the following representations for them.
    i. Unsigned
    ii. Sign-Magnitude
    iii. 1's Complement
    iv. 2's Complement
    v. BCD 9's Complement
    vi. BCD 10's Complement

Q4.

  a. Use two's complement addition example and describe *"Overflow"*.

  b. Draw the truth table for the Binary Half Adder.

  c. Draw the Logic/Block diagram for the Half Adder and briefly describe the operation.

  d. Draw a diagram for Ripple Carry Adder for addition of 3-bit binary numbers.

  e. Explain how we can use a single hardware circuit for two's complement addition and subtraction.