THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

B. SC. DEGREE PROGRAMME 2014/2015

FINAL EXAMINATION

CSU2178 : DIGITAL COMPUTER FUNDAMENTALS

DURATION: TWO HOURS (2 HOURS)

Date: 15.10.2015 **Time: 1.30 p.m – 3.30 pm**

Answer **FOUR** Questions **ONLY.**

Q1.

a. Convert the following Decimal numbers into Binary, Octal and Hexadecimal.

i. 111_{10} ii. 97_{10}

b. Convert the following Binary numbers into Octal and Hexadecimal.

i. 110010101_2 ii. 1010.11_2

c. Convert the following Decimal numbers into BCD format.

i. 35_{10} ii. 937_{10}

d. Draw a truth table for a full adder.

Q2.

a. Prove the following rules with regards to Boolean Algebra.

i. Associative Law

ii. Distributive Law

b. Prove DeMorgan's Theorem.

c. Let X be defined by X = A'BC + ABC' + A'B'C'+ ABC + A'B'C

i. Minimize the expression for X using Boolean rules. State the rules.

ii. Draw the logic circuit for X.

d. Minimize the following truth table using K-map method.

Input				Output
A	B	C	D	Q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

Q3.

a. State two differences between sequential logic and combinational logic?

b. Draw the Block diagrams to represent combinational logic and sequential logic. Describe the function of both logics.

c. Briefly describe the term Circuit Hazard using an example circuit.

d. Draw the truth table for the output of a S-R Flip-Flop.

e. Draw the Circuit diagram and Timing diagram for a clocked S-R Flip-Flop.

Q4.

a. Implement the following gates using two-input NAND gates.

i. NOT ii. OR iii. XOR

b. Briefly explain the following digital circuits.

i. Multiplexer.
ii. Counter.
iii. Register.

c. Draw the block diagram and truth table for a 4 to 1 multiplexer.

d. Implement a 4 to 1 multiplexer using basic logic gates.

Q5.

a. Briefly describe the following terms

i. Von Neumann architecture.

ii. System bus model.

b. Briefly explain the fetch-execute cycle and explain how CPU works for a given data set.

c. Write an advantage and a disadvantage of the Assembly language. Write an Assembly language program to add two values in the main memory and display the result.

Q6.

a. Using examples, briefly explain the existence of a memory hierarchy in a computer system.

b.

i. Design a RAM that stores Four-bit words.(Imagine RAM as a collection of registers)

ii. Draw the simplified version of four-word by the four-bit RAM designed above.

c. State two advantages of a cache memory over main memory.