THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
B. SC. DEGREE PROGRAMME 2015/2016
FINAL EXAMINATION
CSU2178: DIGITAL COMPUTER FUNDAMENTALS
DURATION: TWO HOURS (2 HOURS)

Date: 02.01.2017 **Time: 1.30 pm to 3.30 pm**

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

Q1

a) Convert the following **binary** numbers in to **Octal** and **Hexadecimal**
   i. 101011001010_2
   ii. 1000100.011_2

b) Briefly describe the following
   i. Radix Number System
   ii. EBCDIC character set
   iii. Unicode character set

c) Draw the truth table and logic circuit for the **full adder**.

Q2

a) Write short notes for following combinational circuits
   i. Multiplexer
   ii. Counters
   iii. Registers

b) Implement 8-to-1 Multiplexer by using only 2-to-1 Multiplexers. (Use block diagrams of Multiplexers.)

c) Consider the following truth table.

   i. Write the Boolean expression for the output **F**.
   ii. Implement the Function F by using **16-to-1 Multiplexers** only.

A	B	C	D	F
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

Q3

a) Briefly describe the following

i. The Von-Neumann Model

ii. The System Bus Model

iii. Fetch-Execute cycle

iv. The memory hierarchy of a computer

b) What are the advantages and disadvantages of Assembly language?

c) Consider the following **assembly language program**. (The program has 5 lines). Explain the task of each line.

```
1   ! This program adds two numbers
2                   begin
3                   Org 2048
4   Pro1:  ld [r1] , % X 1
           Ld [r2] , % X 2
           Addcc % X 1, % X 2, X 3
           St % X 3, [r3]
5                   end
```

Q4

a) Briefly describe the following flip flops using appropriate truth tables and circuit diagrams.

i. S-R flip flop
ii. T- flip flop
iii. J-K flip flop

b) Design a **four (04) bit Register** using J-K flip flop

c) What are the differences between **Synchronous counters** and **Asynchronous counters**?

Q5

a) Simplify the following Boolean equations using Boolean algebraic method. (Laws)

i. $P = \overline{A}\ \overline{B}\ \overline{C} + \overline{A}\ B\ C + A\ B\ \overline{C} + A\ \overline{B}\ C$

ii. $Q = \overline{A}\ \overline{B}\ C\ D + \overline{A}\ B\ C\ D + A\ B\ C\ D + A\ \overline{B}\ C\ D$

b) Use the **K'Map** method to simplify the Boolean equation

$S = A\ \overline{B}\ \overline{C}\ D + \overline{B}\ D + \overline{B}\ \overline{C}\ \overline{D} + B\ C\ D + \overline{A}\ \overline{B}\ C\ D + A\ \overline{B}\ C\ D$

c) Implement the Logic circuit of the simplified Boolean equation in (b)

Q6

a) Briefly describe the following

i. The memory hierarchy
ii. Disk file system
iii. Direct Mapped cache

b) Draw a 2 bit register with **Enable (EN), Clock (CLK) and Write (WR)** controls.

c) Design **four-word by eight bit RAM** by using **four-word by four-bit RAMs.**