# ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
## *(Department of Computer Science)*

**Course: Digital Logic Design (3409)**  **Semester: Autumn, 2012**
**Level: Bachelor**  **Total Marks: 100**

## ASSIGNMENT No. 1

*Note: All questions are compulsory and carry equal marks.*

Q. 1 a) Convert the following binary numbers to decimal system:
  i) 10111101  ii) 1110100

  b) Perform the subtraction with the following decimal numbers using 1's complements and 2's complements.
  i) 1010100 – 1000100  ii) 11101011 – 1001110

Q. 2 a) Explain the process of following conversions with examples:
  i) Binary to Octal and Hexadecimal
  ii) Octal and Hexadecimal to Binary

  b) Differentiate Map method and Tabulation method in detail. Also discuss difference better Adder and Subtractor.

Q. 3 a) Expand the following Boolean functions into their canonical forms:
  $$F_1(A,B,C) = A'B + C \qquad F_2(A,B,C) = AB + A'C + AB'C$$

  b) What are logic gates? Differentiate the following gates AND, OR, NAND and NOR.

Q. 4 a) Design a combinational circuit that accepts a three-bit number and generates an output binary number equal to the square of the input number.

  b) Implement the Boolean function:
  $$F = AB'CD' + A'BCD + AB'C'D + A'BC'D$$
  With exclusive-OR and AND gates.

Q. 5  Write a note on each of the following:
   a)   Binary Logic and ICs
   b)   Gates
   c)   Boolean Functions
   d)   Tabulation Method

# ASSIGNMENT No. 2

**Total Marks: 100**

Q. 1  a)   Design a BCD-to-excess-3 code convertor with a BCD-to-decimal decoder and four OR gates.
   b)   Differentiate between full adder and half adder.

Q. 2  a)   Show the logic diagram of a clocked RS flip-flop with four NAND gates.
   b)   Design a counter with the following binary sequence: 0, 1, 3, 7, 6, 4 and repeat. Use T flip-flops.

Q. 3  a)   Differentiate Ripple Counters and Synchronous Counters with the help of an example.
   b)   Differentiate between multiplexer and de-multiplexer.

Q. 4  a)   What is the difference between serial and parallel transfer? What type of register is used in each case?
   b)   Draw the interconnection of $I^2L$ gates to form a 2x4 decoder.

Q. 5  Write a note on each of the following:
   a)   Memory
   b)   Register Counter
   c)   Decimal Adder
   d)   CMOS

## 3409 Digital Logic Design            Credit Hours: 4 (4+0)

*Recommended Book:*
*Digital Logic Design by Morris Mano*

**Course Outlines:**

**Unit–1:**     **Binary System**
Binary Numbers Based Conversion of Octal, Hexadecimal and Binary, Complements, Binary Codes, Binary Logic and ICs

**Unit–2:**     **Boolean Algebra and Logic Gates**
Definitions, Theorems and Properties, Boolean Functions, Canonical and STD Forms, other Logical Properties, Gates

**Unit–3:**     **Simplification of Boolean Function**
Map Method, NAND and NOR Implementation, Tabulation Method, Prime Implement

**Unit–4:**     **Combination Logic**
Design Procedure, Adder, Subtractors, Code Conversation Analysis Procedure, NAND and NOR Functions, Ex-OR and Ex-NOR Function

**Unit–5:**     **Combination Logic with MSI and LSI**
Binary Parallel Adder, Decimal Adder, BCD Counter, Magnitude Compactor, Decoders, Demultiplexers, Encoder, Multiplexer, ROM, PLA

**Unit–6:**     **Sequential Logic**
Introduction, Flip Flop, Triggering, State Reduction Excitation Table, Design Procedure, Design of Counter

**Unit–7:**     **Register, Counter, and Memory Unit**
Register Counter, Timing Sequence, Memory Unit

**Unit–8:**     **Asynchronous Sequential Logic**
Analysis Procedure, Circuits with Latches, Design Procedure, Reductions of State and Flow Tables, Race Free State Assignment

**Unit–9:**     **Digital Integrated Circuits**
Bipolar Transistor Characteristics, RTL and DTL Circuits, Transistor, Transistor Logic, Emitter Coupled Logic (ECL), Metal Oxide Semiconductor (MOS), CMOS