Digital Circuits and Logic Design
## (CS-205, Dec-07)

Section-A

1). a). Find the value of x in the following.
   $(1100.1011)_2 = (x)_{10}$
   b). Realize AND gate using NOR gate only.
   c). Differentiate between synchronous and asynchronous counters.
   d). Define the term resolution of a D/A converter.
   e). What is the minimum voltage value that is considered as high stage input in case of TTL logic family.
   f). A presettable counter has eight flipflops. If the preset number is 125, what is the modulus?
   g). What are the advantages of CMOS memory chips over bipolar memory chips?
   h). Define 1's and 2's complements.
   i). Define the term resolution of an A/D inverter.
   j). Using Boolean algebraic theorems, prove that
   $$A + \overline{A}B + A\overline{B} = A + B$$

Section-B

2). Find the value of x in the following:
   (a) $(835)_{10} = (x)_{BCD'}$ (b). $(ETC.B)_{16} = (x)_8$ (c). $(1101.101)_2 = (x)_{10}$
   (d). $(12.354)_{10} = (x)_2$ (e). $(BEE)_x = (2699)_{10}$
3). Simplify the following Boolean functions using K-maps.
   (a) $F(A,B,C) = \Sigma(0,2,3,4,6)$
   (b) $F(A,B,C,D) = \Sigma(1,3.5/7,9,15)$, $d(A,B,C,D) = \Sigma(4,6,12,13)$
4). Draw and explain the operation of TTL inverter.
5). Implement the following Boolean function with a multiplexer.
   $F(A,B,C,D) = (0,1,3,4,8,9,15)$
6). Draw the circuit diagram of a mod-5 counter and convert it into decade counter.

Section-C

7). Name and discuss the various types of semiconductor memories.
8). (a) Write a short note of Bus structures.
   (b) Derive a state table and state diagram of the following sequential circuit.
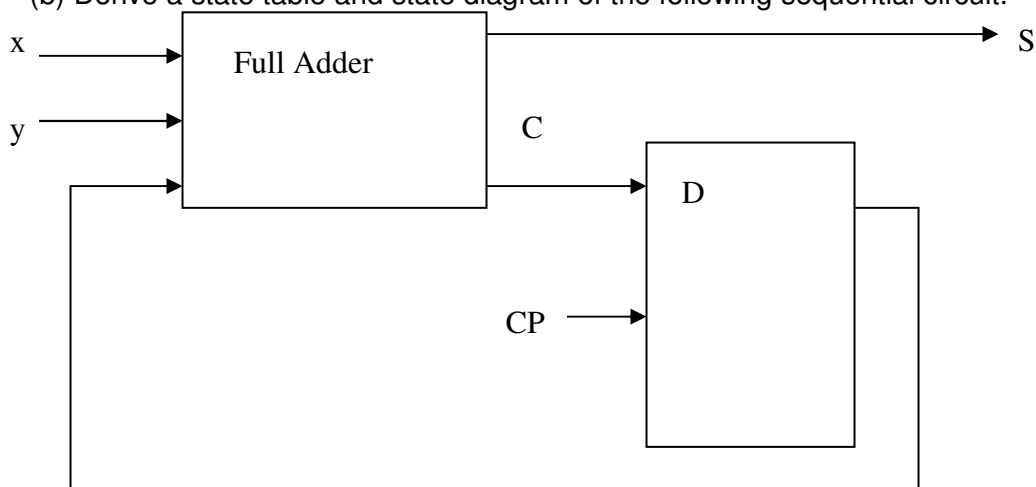
9). (a) Find the output voltage from a 5 bit ladder that has a digital input of 11010. Assume that 0=0v and 1 = +10v
(b) Write a short note on VLSI design.