# EC 2.101 - Digital Systems and Microcontrollers

# Practice Sheet 1 (Lec 1 – Lec 9)

## Q1. Base Conversions

- a.  $(5641)_7$  into base 3.
- b.  $(F3E612)_{16}$  into base 8, 4 and 2.
- c.  $(10110.0101)_2$ ,  $(16.5)_{16}$ ,  $(26.24)_8$ ,  $(DADA.B)_{16}$  into decimal.
- d.  $(A4389)_{16}$  into BCD and  $(100000101111000111)_{BCD}$  into decimal.

#### Q2. Complements

Perform the calculations assuming the binary numbers are in signed 2's complement representation (Convert the remaining before addition).

- a.  $(-7634)_8 + (-512)_{10} + (+4AF)_{16} + (011001100110)_2$  [16 bit]
- b.  $(+657)_9 + (-565)_7 + (100001000101)_{BCD} + (1101010110)_2 [12 bit]$
- c.  $(1000100101010111)_{BCD} + (+7345)_8 + (4FB)_{16} [16 bit]$

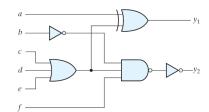
## Q3. Boolean Expressions

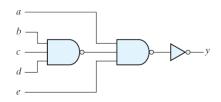
- a. Show that the dual of (xy' + x'y) is equal to its complement.
- b. Simplify the following expressions.
  - i. x'y + yz + xz' + x'y' + xyz'
  - ii. xyz + x'y'z + xy'z + xz + xzy'
  - iii. xy + xy' + x'y'z + xy'z' + xyz
  - iv. x'y + x'y'z + xyz' + xy + xy'z'

#### Q4. Logic Gates

a.

Write the Boolean expressions describing the outputs of the circuits given below.





b.