Tutorial 1

1) Convert the following numbers with indicated bases to decimal

a) $(735)_8$ b) $(FAFA)_{16}$

c) $(1010.1010)_2$

2) In a particular design which uses 5 bits for integral part and 7 bits for fractional part, the result of some operation is 7B8 hex. Find the corresponding decimal equivalent?

3) Do the following conversion problems:

(a) Convert decimal 27.315 to binary.

(b) Calculate the binary equivalent of 2/3 out to eight places. Then convert from binary to decimal. How close is the result to 2/3?

(c) Convert the binary result in (b) into hexadecimal. Then convert the result to decimal. Is the answer the same?

4) Simplify each of the following expressions by applying the theorems. State the theorems used

a) $(A' + B' + C)(A' + B' + C)'$ b) $A' (B + C)(D'F + F)' + (D'F + F)$

c) $(W'+X+YZ) (W+X'+YZ)$ d) $(W'+X)YZ'+(W'+X)'YZ'$

5) Draw the logic diagram corresponding to the following Boolean expressions without simplifying them:

(a) $BC + AB + ACD$ (b) $(A + B)(C + D)(A ' + B + D)$

6) Implement the Boolean function F = xy+x'y'+y'z with

a) NAND and inverter gates

b) NOR and inverter gates

7) Find the complement & dual of the following expressions:

a) $w+(ab+c')(d'e+1)+g(h'+0)$ b) $a'b'(c'+d)(c+d')+ab(c'd+cd')$

c) $[(ab+c'd+e'+0)(a'+bc)+(d'e+b)](c+e')$ d) $(x' + y + z')(x + y')(x + z)$

8) An assembly line has 3 fail safe sensors and one emergency shutdown switch.

The line should keep moving unless any of the following conditions arise:

(i) If the emergency switch is pressed

(ii) If the sensor1 and sensor2 are activated at the same time.

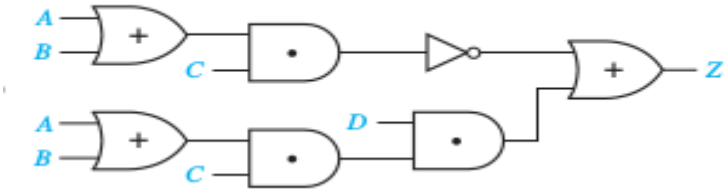
(iii) If sensor 2 and sensor3 are activated at the same time.

(iv) If all the sensors are activated at the same time

Give a Boolean expression for above case?

9) For the following circuit, find the output and design a simpler circuit that

has the same output. (Hint: Find the circuit output by first finding the output of each gate, going from left to right, and simplifying as you go).



10) i) Multiply out to obtain a Sum of Products

a) (A+B′C+D′)(B′C+D′+E)(A+E′)(AD+E′) b)(A+B′)(A+C+D′)(A+B+D′)
c) (A′+B)(A′+C)(C+D)(B+D)

ii) Factor each of the following expressions to obtain a product of sums:
a) WX′+WY′X+ZYX b)AB′+ACD+ADE′