EE115B-Digital Circuits

2nd semester AY 2021/2022

HW1

Due on March 30, 2022

1. Number conversion (5 points each)

(1) 11110111B= 247 D= F7 H

(2) $(6DF7)_{16}$ = (0110 1101 1111 0111)$_2$

(3) $(143)_{10}$ = (10001111)$_2$

(4) $(82)_{10}$ = (1010010)$_2$

(5) $(110111)_2$ = (55) $_{10}$

(6) $(11011110111)_2$ = (6F7)$_{16}$

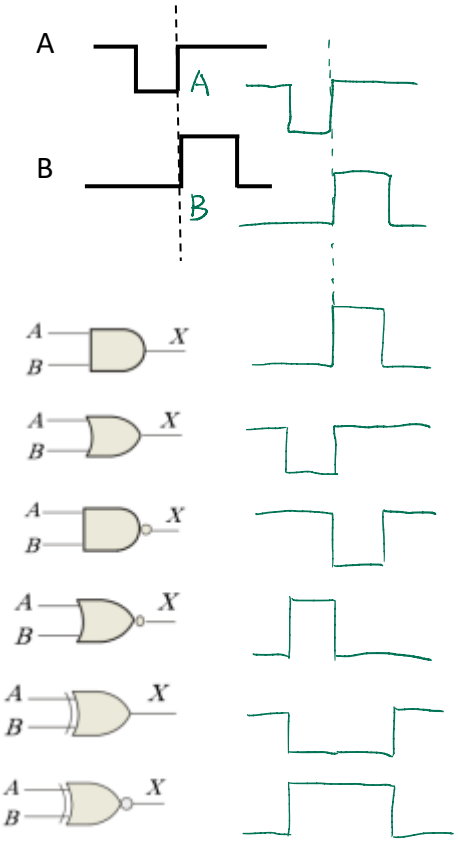
(7) $(32)_{10}$ = (20)$_{16}$

2. Code conversion (10 points)

Decimal	Binary	8421 BCD Code
0	00000	
1	00001	
2	00010	
3	00011	
4	00100	
5	00101	
6	00110	
7	00111	
8	01000	
9	01001	
10	01010	
11	01011	
12	01100	
13	01101	
14	01110	
15	01111	
16	10000	
17	10001	
18	10010	
19	10011	
20	10100	
21	10101	
22	10110	
23	10111	
24	11000	
25	11001	
26	11010	

27	11011	00/00111
28	11100	00/01000
29	11101	00/01001
30	11110	00110000
31	11111	00110001

3. Plot the output (X) waveforms (10 points)



4. Simplify the following expression (10 points)

$$\mathrm{L} = \mathrm{AD} + \mathrm{A}\overline{D} + AB + \overline{A}C + BD + A\overline{B}\mathrm{EF} + \overline{B}EF$$

$L = A + A'C + BD + B'EF = A + C + BD + B'EF$

5. Transform the logical expression $\mathrm{L} = \overline{A}\,\overline{B}C + A\overline{B}\,\overline{C}$ and draw the corresponding circuits (only use the 2-input NOR gate). (20 points)

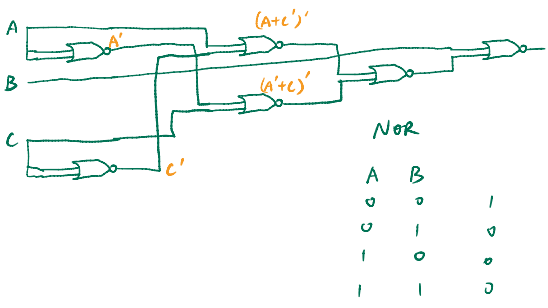
$A'B'C + AB'C'$

$= B'(A'C + AC')$

$= [B'(A'C + AC')]'' = [B + (A'C + AC')']'$

$= \{B + [(A'C)'' + (AC')'']'\}'$

$= \{B + [(A + C')' + (A' + C)']'\}'$



6. Draw the energy band diagram for the forward and reverse biased P-N junction (5 points)

7. Draw the logic diagram based on the truth table. (10 points)

A	B	C	L
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0