

LAB #3

$\begin{array}{r} - \\ \hline 32 & 16 & 8 & 4 & 2 & 1 \end{array}$

A) Arithmetic operations in 7 bit

1.) $39 + 27$

$$39 = 0100111$$

$$\begin{array}{r} 32 \\ 16 \\ 8 \\ 4 \\ 2 \\ 1 \end{array}$$

$$27 = 011011$$

$$\begin{array}{r} 32 \\ 16 \\ 8 \\ 4 \\ 2 \\ 1 \end{array}$$

$$\begin{array}{r} 11111 \\ 0100111 \\ \hline 0011011 \\ \hline 1000010 \end{array}$$

$$1000010 = 66$$

$$6432168421$$

2.) $-17 + 17 = 0000000$

$$-17 = 17 \text{ in binary} = 0010001$$

$$\begin{array}{r} 11111 \\ 1101111 \\ + 0010001 \\ \hline *0000000 \end{array}$$

$\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow$

$$\begin{array}{r} 1101110 \\ + 1 \\ \hline 1101111 \end{array}$$

3.) $-37 - 32 = 0111011$ $-32 = 32 \text{ in binary} = 0100000$

$$-37 = 37 \text{ in binary} = 0100101$$

$$\begin{array}{r} 11111 \\ 1011010 \\ + 1 \\ \hline \end{array}$$

$$\begin{array}{r} 11111 \\ 1011111 \\ + 1 \\ \hline \end{array}$$

$$\begin{array}{r} 32 \\ + 16 \\ \hline 48 \\ + 8 \\ \hline 56 \\ + 3 \\ \hline 59 \end{array}$$

$$\begin{array}{r} + 1 \\ \hline 0111011 \end{array}$$

$$1100000$$

$$\begin{array}{r} 1011011 \\ 1100000 \\ \hline *0111011 \end{array}$$

$$0111011$$

$$32168421$$

B) Logic Operations

- 1.) Set middle 4 bits of an 8 bit pattern
w/out disturbing other bits

$$\begin{array}{r} \text{XXXX XXXX OR} \\ \underline{0111 \quad 1100} \\ \text{XX11 11XX} \end{array}$$

- 2.) Take complement of MSB of 8 bit w/out changing others

$$\begin{array}{r} \text{XXXX XXXX} \\ \underline{1000 \quad 0000} \text{ XOR} \\ \text{XXX1 XXXX} \end{array}$$

- 3.) Clear all but least significant bit of 8 bit pattern
w/out disturbing least significant bit

$$\begin{array}{r} \text{XXXX XXXX} \\ \underline{0000 \quad 0001} \text{ AND} \\ \text{0000 0001} \end{array}$$

- 4.) Change an uppercase ASCII character to lower case

$$'A' = 65 \quad 0100001$$

$$'a' = 97 \quad 0110001$$

$$\begin{array}{r} 0100001 \\ \underline{00100000} \text{ OR} \\ 0110001 \end{array}$$

C. 1.) given logic circuits, construct truth table describes its behavior

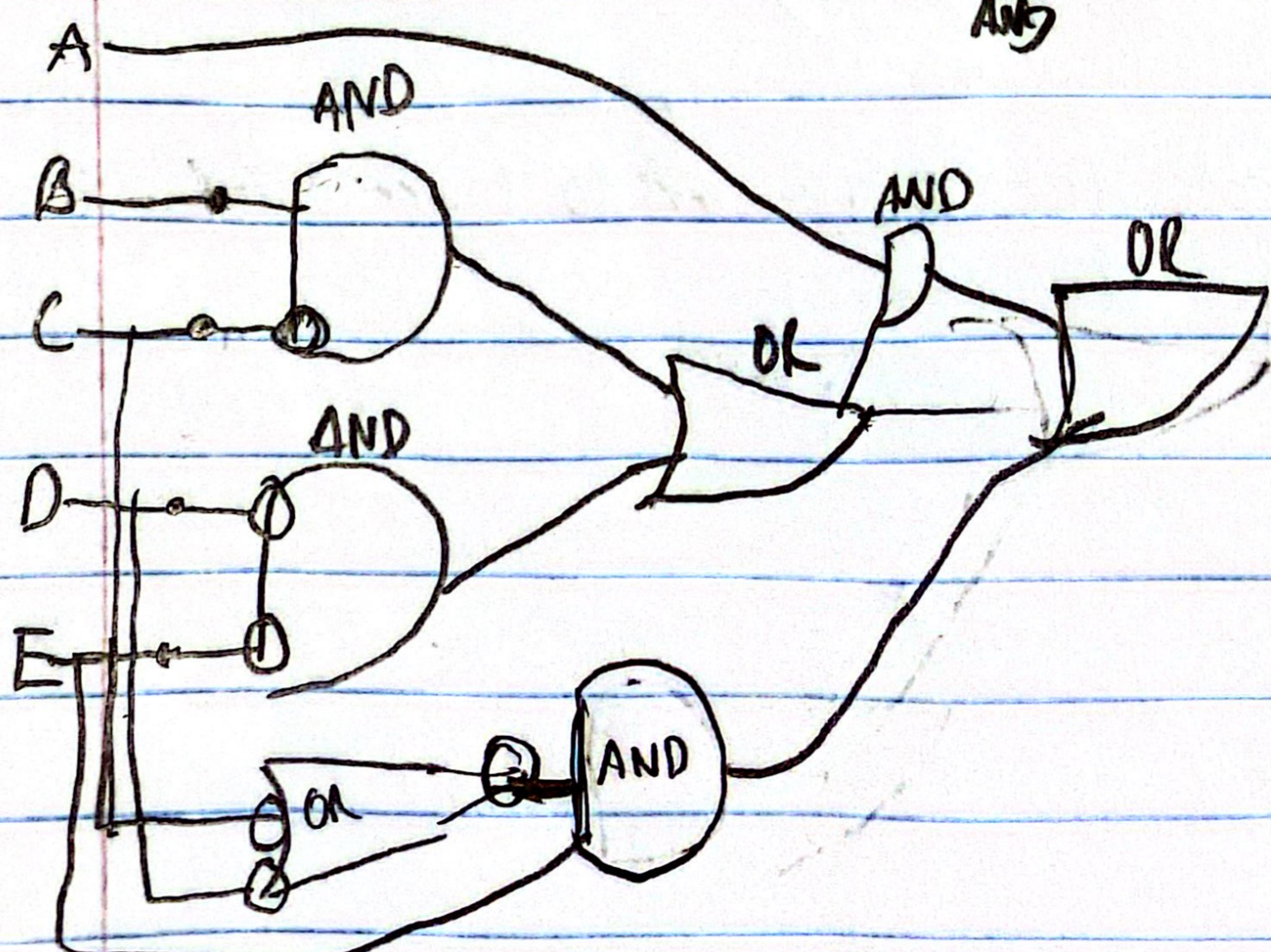
A	B	C	F	G
0	0	0	0	1
0	0	1	1	0
0	1	0	0	1
0	1	1	1	0
1	0	0	0	0
1	0	1	1	0
1	1	0	1	1
1	1	1	0	0

2.) Design circuit implements functions f below using AND, OR, NOT.

$$f = A \cdot ((B \cdot \bar{C}) + (\bar{D} \cdot \bar{E})) + \bar{B} \cdot ((\bar{A} \cdot D) \cdot E)$$

NOT NOT NOT
 | | |
 AND AND OR
 | | |
 AND

NOT NOT
 | |
 OR AND



3.) Given truth table, generate circuit

A	B	C	T
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0	0	0	0
---	---	---	---

0	0	1	1
---	---	---	---

0	1	0	0
---	---	---	---

4 1's need 4

0	1	1	1
---	---	---	---

1	0	0	1
---	---	---	---

1	0	1	0
---	---	---	---

1	1	0	1
---	---	---	---

1	1	1	0
---	---	---	---

