

# ECE 124: Homework 1

## Spring 2023

Assigned: Friday, February 24<sup>th</sup>  
Due: Friday, March 3<sup>rd</sup>

**Show your work! (No credit even for correct answers without justification.)**

---

*Problems from the textbook (Digital Design 6<sup>th</sup> Ed., M. Mano and M. Ciletti)*

**1 Convert the following numbers with the indicated based to decimal: (each for 4 points)**

- (a)  $(4310)_5$
- (b)  $(198)_{12}$
- (c)  $(445)_8$
- (d)  $(345)_6$

**2. Convert the following binary numbers to hexadecimal and to decimal:**

- (a) 1.10010 **(4 points)**
- (b) 110.010 **(4 points)**

**3. (each for 4 points)**

- (a) Find the 16's complement of C3AF.
- (b) Convert C3AF to binary
- (c) Find the 2's complement of the result in (b)
- (d) Convert the answer in (c) to hexadecimal and compare with the answer in (a).

**4. Convert decimal +49 and +29 to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers. Then perform the binary equivalent of  $(+29) + (-49)$ ,  $(-29) + (+49)$ , and  $(-29) + (-49)$ . Convert the answers back to decimal and verify that they are correct. (each for 5 points)**

- (a)  $(+29) + (-49)$
- (b)  $(-29) + (+49)$
- (c)  $(-29) + (-49)$
- (d) Convert the answers back to decimal and verify that they are correct.

**5. Convert decimal 6514 and 3274 to both BCD and ASCII codes. For ASCII, an even parity bit is to be appended at the left.**

- (a) BCD code **(4 points)**
- (b) ASCII code **(4 points)**

**6. Assign a binary code in some orderly manner to the 52 playing cards. Use the minimum number of bits. (2 points)**

7. The following is a string of ASCII characters whose bit patterns have been converted into hexadecimal for compactness: 73 F4 E5 76 E5 4A EF 62 73. Of the eight bits in each pair of digits, the leftmost is a parity bit. The remaining bits are the ASCII code.

(a) Convert the string to bit form and decode the ASCII. (each for 4 points)

(b) Determine the parity used: odd or even? (each for 2 points)

8. Simplify the following Boolean expressions to a minimum number of literals (each for 4 points)

(a)  $xy + xy'$

(b)  $(x + y)(x + y')$

(c)  $xyz + x'y + xyz'$

(d)  $(x + y)'(x' + y)'$

(e)  $(a + b + c')(a'b' + c)$

(f)  $a'bc + abc' + abc + a'bc'$

USASCII code chart

<div> <div> <div> <div> <div>b<sub>7</sub></div> <div>b<sub>6</sub></div> <div>b<sub>5</sub></div> </div> <div> <div>b<sub>4</sub></div> <div>b<sub>3</sub></div> <div>b<sub>2</sub></div> <div>b<sub>1</sub></div> </div> </div> <div> <div>Column</div> <div>Row</div> </div> </div> </div>					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
					0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL