Name:_____

Data Representation, Logic, Huffman Coding, Binary Numbers

DU ⁝:1:20pm Monday Nov. 28 at the beginning of classP ease staple all sheets together BEFORE class.

Goal: The purpose of this assignment is to get a little practice with binary numbers, think about representing data digitally, and review basic logic as the foundation of how computers compute.

Exercises:

Binary Numbers

1 Convert 10 base 10 to base 2. _____

2 Convert 16 base 10 to base 2. _____

3 Convert 32 base 10 to base 2. _____

4 Convert 217 base 10 to base 2. _____

5 Convert RGB color (128, 0, 255) to base 2. (_____, _____, _____)

6 Add 1101011 base 2 to 1011100 base 2, SHOW YOUR WORK.

7 Add 1011 base 2 to 110 base 2. SHOW YOUR WORK.

1101011	1011
+1011100	+ 110

8 What letters does this binary (base 2) data correspond to assuming it is in ASCII?
01001010, 01100001, 11110111, 00110000 = ____, ____, ____, ____

ASCII	0000 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111	0000 1000	0000 1001	0000 1010	0000 1011	0000 1100	0000 1101	0000 1110	0000 1111
0000	NU	SH	SX	EX	ET	EQ	AK	BL	BS	HT	LF	YT	FF	CR	S0	SI
0001	DL	D1	D2	D3	D4	NK	SY	EΣ	CN	EM	SB	EC	FS	GS	RS	US
0010		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0011	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0100	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0101	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
0110	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0111	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DT
1000	80	81	82	83	IN	NL	SS	ES	HS	HJ	YS	PD	PV	RI	S2	S3
1001	DC	P1	PZ	SE	CC	MM	SP	EP	Q8	QQ	QA	CS	ST	OS	PM	AP
1010	Ao	¡	¢	£	♀	¥	¦	§	¨	©	♂	«	¬	-	®	¯
1011	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
1100	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
1101	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	β
1110	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
1111	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	Þ	ÿ

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Logic

9 Complete the following truth tables.

(a) NOT (p OR q)

p	q	p OR q	NOT (p OR q)
1	1		
1	0		
0	1		
0	0		

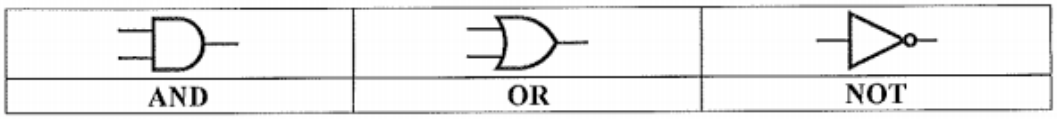
(b) p AND (NOT q)

p	q	NOT q	p AND (NOT q)
1	1		
1	0		
0	1		
0	0		

(c) p AND q AND r

p	q	r	p AND q	(p AND q) AND r
1	1	1		
1	0	1		
0	1	1		
0	0	1		
1	1	0		
1	0	0		
0	1	0		
0	0	0		

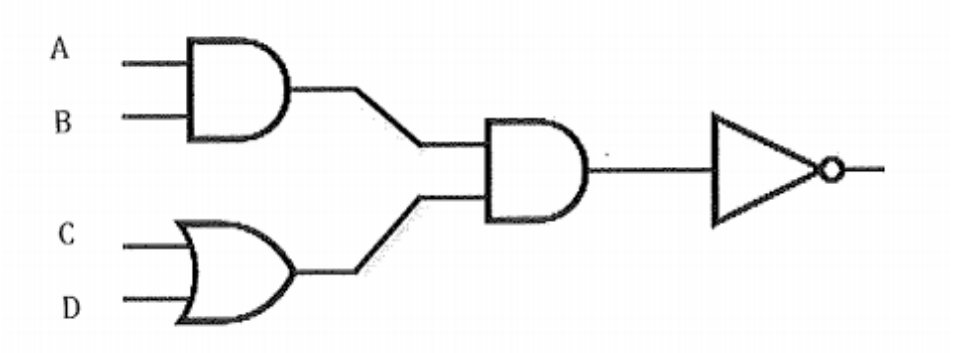
10 Using the 3 basic logic gates shown here, draw logic diagrams for the following logical statements.



a NOT (P OR Q)

b (A OR B) AND (NOT C)

11 Write the logical statement that corresponds to the following logic diagram.



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Huffman Coding *(Please attach a separate sheet of paper for the Huffman trees.)*

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a Generate a binary Huffman tree from the following letter frequencies for the word *bananarama*.

letter	b	a	n	r	m
frequency	1	5	2	1	1

b Using the binary Huffman tree you created for (a), give the binary Huffman encoding for the letter sequence *barn.* _____

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a Generate a binary Huffman tree from the letter frequencies in the tongue twister: *She sells sea shells by the seashore*. Do not include the space character in your tree.

b Using the binary Huffman tree you created for (a), give the binary Huffman encoding for the letter sequence *share*. _____

14 Create the Huffman tree that goes with the following frequency table.

letter	c	s	r	t	e
frequency	1	2	3	4	7