Digital Communication II – EADOM2B – Test 4 – 19/05/2017 – 08h00

1 In a document containing only 7 characters the character count was as follows: B – 90; D – 66, E – 102; G – 96; M – 90, P – 72 and X – 84.

1.1 Determine the Huffman code for each character and the Huffman average for the coding system.

1.2 Calculate the compression ratio of the code. (8)

2 Insert Hamming bits in the standard positions for the letter P. (4)

3 Determine if the following, containing Hamming bits in the standard positions, has an error.

3.1 If it has an error, correct the error.

3.2 Determine the original letter. (6)

4 Use ODD parity, 1 as start bit an 11 as a stop bits. Code the word **Milk** for RS232 transmission. (6)

5 The RS232 code $59B65B739459_H$ contains 2 start bits and 1 stop bit. (6)
Determine the start bits, stop bit, type of parity used and the word transmitted.

TOTAL: /30/

0100 0001	A	0110 0001	a	0100 0010	B	0110 0010	b	0100 0011	C	0110 0011	c	0100 0100	D	0110 0100	d
0100 0101	E	0110 0101	e	0100 0110	F	0110 0110	f	0100 0111	G	0110 0111	g	0100 1000	H	0110 1000	h
0100 1001	I	0110 1001	i	0100 1010	J	0110 1010	j	0100 1011	K	0110 1011	k	0100 1100	L	0110 1100	l
0100 1101	M	0110 1101	m	0100 1110	N	0110 1110	n	0100 1111	O	0110 1111	o	0101 0000	P	0111 0000	p
0101 0001	Q	0111 0001	q	0101 0010	R	0111 0010	r	0101 0011	S	0111 0011	s	0101 0100	T	0111 0100	t
0101 0101	U	0111 0101	u	0101 0110	V	0111 0110	v	0101 0111	W	0111 0111	w	0101 1000	X	0111 1000	x
0101 1001	Y	0111 1001	y	0101 1010	Z	0111 1010	z								

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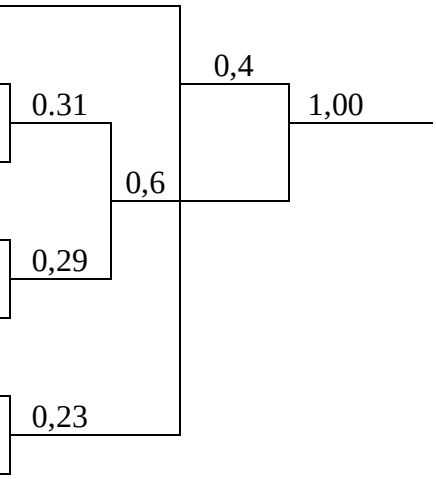
1.1 Determine the Huffman code for each character and the Huffman average for the coding system.

Char	Count	P(x)	Diagram	Code	n	nP(x)
B	102	0,17		11	2	0,34
G	96	0,16		110	3	0.48
K	90	0,15		010	3	0,45
Q	90	0,15		100	3	0,45
L	84	0,14		000	3	0,42
W	72	0,12		101	3	0,36
F	66	0,11		001	3	0,33
	600	1,00		Huffman Av		2,83



1.2 Calculate the compression ratio of the code. = 3/2,83 = 1,06 (8)

2 Insert Hamming bits in the standard positions for the letter P.

				H				H		H	H
12	11	10	9	8	7	6	5	4	3	2	1
0	1	0	1	0	0	0	0	0	0	1	0

11	1011
9	1001
H	0010

(4)

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				H				H		H	H
12	11	10	9	8	7	6	5	4	3	2	1
0	1	0	1	1	1	0	0	0	0	0	1
0	1	0	1	1	1	0	0	0	1	0	1

11	1011
9	0110
7	0111
3	0011
H	1001
E	0000= 0

No error. Data = 0101 1001 = Y

(6)

4 M = 0100 1101 → 1 1011 0010 1 11 → D97
i = 0110 1001 → 1 1001 0110 1 11 → CB7
l = 0110 1100 → 1 0011 1110 0 11 → 9F3
k = 0110 1011 → 1 1101 0110 0 11 → EB3 Milk = $D97CB79F3EB3_H$

(6)

5 Group size = 8+1+1+2 = 12

5 9 B 6 5 B 7 3 9 4 5 9
01 0110 0110 1 1, 01 1001 0110 1 1, 01 1100 1110 0 1, 01 0001 0110 0 1
5 **5** **5** **3**
0110 0110 0110 1001 0111 0011 0110 1000
f **i** **s** **h**

start bits = 01, stop bits = 1, type of parity = ODD and the word = fish (6)

TOTAL: /30/