Digital Communication II (EADOM2B) Test 4 – 22/10/2015 – 13h00 to 14h00

1 In a document containing only 7 characters the character count was as follows: A – 90; B – 66, C – 102; D – 96; E – 90, F – 72 and G – 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 For a 36/38 TDM system using the same standards as a 30/32 system and a sampling frequency of 15 kHz with 16 bits/slots, calculate:

2.1 The frame duration. 2.2 The multi-frame duration.

2.3 The slot duration. 2.4 The bit duration.

2.5 The output gross line bit rate in bits/second. (5)

3 The following data containing Hamming bits in the standard positions was received:
0 1 0 0 1 0 1 1 1 0 0 1

3.1 If any, determine the error position and in that case, give the corrected data.

3.2 Determine the original character transmitted. (4)

4 Code the word **Look** for RS232 transmission. Use 1 as atart bit and 11 as stop bits with EVEN parity. Show all steps in the coding. (6)

5 Determine the type of parity, start bits (2), stop bits (2) and word in the following RS232 data received: **4 A 8 B 4 D 5 C E 2 9 7 5** $_{H}$ (7)

TOTAL: /30/

ASCII Table

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

1

1.1

Chr	Cnt	P(x)				Code	n	n.P(x)	$L_2P(x)$	
C	102	0,17				11	2	0,34	-2,556	-0,435
D	96	0,16	0,31			110	3	0,48	-2,644	-0,423
A	90	0,15	A,D	0,60		010	3	0,45	-2,737	-0,411
E	90	0,15	0,29	GEAD	1,00	100	3	0,45	-2,737	-0,411
G	84	0,14	G,E			000	3	0,42	-2,837	-0,397
F	72	0,12	0,23	0,40		101	3	0,36	-3,059	-0,367
B	66	0,11	B,F	BFC		001	3	0,33	-3,184	-0.350
	600	1,00						2,83		-2,794

1.2 CR = STD/HA = 3/2,83 = 1,06 (8)

2.1 The frame duration. 1/15 kHz = 66,7 µs 2.2 The multi-frame duration. 66,7.19 = 1,27 ms

2.3 The slot duration. 66,7/38 = 1,755 µs 2.4 The bit duration. 1,755/16 = 0,11 µs

2.5 The output gross line bit rate in bits/second. 1/0,11 = 9,12 Mb/s (5)

3 The following data containing Hamming bits in the standard positions was received:

H H HH
2 1 0 9 8 7 6 5 4 3 2 1
0 1 0 0 1 0 1 1 1 0 0 1
11 = 1011
6 = 0110
5 = 0101
H = 1101
E = 0101 = 5
Corrected 0 1 0 0 1 0 1 **0** 1 0 0 1
Data = 0 1 0 0 0 1 **0** 0 = D (4)

4 Code the word **Look** for RS232 transmission. Use 1 as atart bit and 11 as stop bits with EVEN parity. Show all steps in the coding. (6)

L 0100 1100 1 0011 0010 1 11
o 0110 1111 1 1111 0110 0 11
o 0110 1111 1 1111 0110 0 11
k 0110 1011 1 1101 0110 1 11
1001 1001 0111 1111 1011 0011 1111 1011 0011 1110 1011 0111
$997FB3FB3EB7_H$

5 Determine the type of parity, start bits (2), stop bits (2) and word in the following RS232 data received: **4 A 8 B 4 D 5 C E 2 9 7 5** $_H$ (7)

4 A 8 B 4 D 5 C E 2 9 7 5
0100 1010 1000 1011 0100 1101 0101 1100 1110 0010 1001 0111 0101
01 00101010 0 01 01 10100110 1 01 01 11001110 0 01 01 00101110 1 01
Start = 01, Stop = 01
00101010 0 (3) 10100110 1 (5) 11001110 0 (5) 00101110 1 (5)
Parity is ODD
0010 1010 1010 0110 1100 1110 0010 1110
0101 0100 0110 0101 0111 0011 0111 0100
T e s t

TOTAL: /30/