

Digital Communication II – EADOM2B – Test 3

1	A FDM system is constructed with 12 channels per group, 8 groups per major group, 11 major groups per super group and 3 super groups in the final stage. The channel separation is 3.7 kHz. Determine the number of voice channels in this system and explain if it is possible to use this structure in a co-axial transmission system. Show all calculations. Give criticism on the system.			(6)
2	For a 38/40 TDM system using the same standards as a 30/32 system and a sampling frequency of 12 kHz with 12 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.			(6)
3	In a document containing only 6 characters the character count was as follows: G – 44 ; F – 24 ; B – 68 ; M – 40 ; Q – 48 and L – 56.			
3.1	Determine the optimal Huffman code for each character and the Huffman average for the coding system.			
3.2	Calculate the compression ratio of the code.			(10)
4	Data was received from a transmission system using standard RS232 principles. The data contains 2 start bits, 8 data bits, a parity bit and 2 stop bits. The data is: F 8 A F E D 7 F 6 B 9 3 1			
4.1	Determine the values of the start and stop bits and the type of parity used.			
4.2	Determine the word received.			(8)
	TOTAL:			/30/

0010	1110	.
0010	1111	/
0011	0000	0
0011	0001	1
0011	0010	2
0011	0011	3
0011	0100	4
0011	0101	5
0011	0110	6
0011	0111	7
0011	1000	8
0011	1001	9
0011	1010	:

0010	0001	!
0010	0010	“
0010	0011	#
0010	0100	\$
0010	0101	%
0010	0110	&
0010	0111	‘
0010	1000	(
0010	1001)
0010	1010	*
0010	1011	+
0010	1100	,
0010	1101	-

0100	0001	A
0100	0010	B
0100	0011	C
0100	0100	D
0100	0101	E
0100	0110	F
0100	0111	G
0100	1000	H
0100	1001	I
0100	1010	J
0100	1011	K
0100	1100	L
0100	1101	M

0110	0001	a
0110	0010	b
0110	0011	c
0110	0100	d
0110	0101	e
0110	0110	f
0110	0111	g
0110	1000	h
0110	1001	i
0110	1010	j
0110	1011	k
0110	1100	l
0110	1101	m

0100	1110	N
0100	1111	O
0101	0000	P
0101	0001	Q
0101	0010	R
0101	0011	S
0101	0100	T
0101	0101	U
0101	0110	V
0101	0111	W
0101	1000	X
0101	1001	Y
0101	1010	Z

0110	1110	n
0110	1111	o
0111	0000	p
0111	0001	q
0111	0010	r
0111	0011	s
0111	0100	t
0111	0101	u
0111	0110	v
0111	0111	w
0111	1000	x
0111	1001	y
0111	1010	z

Digital Communication II – EADOM2B – Test 3 Memorandum

1	Voice channels = 12.8.11.3 = 3168 ✓ BW = 3168x3.7 = 11.721 MHz ✓✓ Can fit with very little free space ✓ Channel separation of 3.7 kHz only 0.3 separation from voice up to 3.4 kHz ✓✓	(6)										
2	FD = 1/12k = 83.33 μs ✓ MFD = FDx20 = 1.67 ms ✓ SD = FD/40 = 2.083 μs ✓ BD = SD/12 = 0.1736 μs ✓ GLBR = 1/BD = 5.76 MB/s ✓✓	(6)										
3	In a document containing only 6 characters the character count was as follows: G – 44 ; F – 24 ; B – 68 ; M – 40 ; Q – 48 and L – 56. (Arrange largest to smallest) <table><tr><td>Chr</td><td>Count</td><td>P(x)</td><td></td><td>Code</td><td>n</td><td>nP(x)</td></tr><tr><td>B</td><td>68</td><td>0,243</td><td rowspan="8"> 1.000 0.328 0.200 0.171 0.157 0.143 0.086 0.229 0.429 0.571 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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