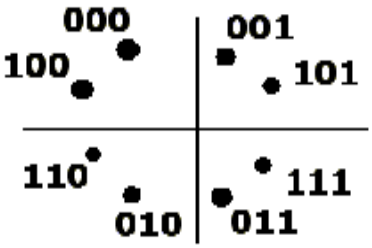
Test 3 – Friday 12/05/2017 at 08h00

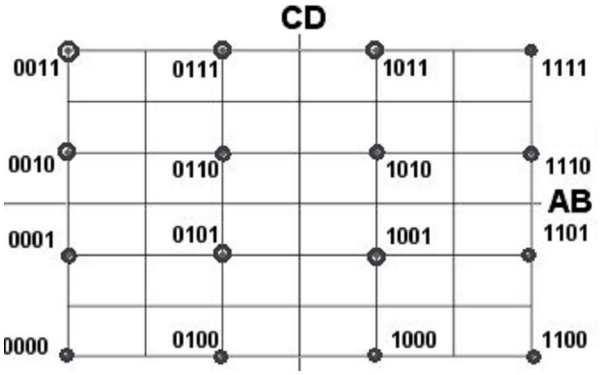
1 Use the constellation diagram (CBA) and tables given to determine the output of an 8 PSK differential signal that must be transmitted with default value 101,The input data is: 101, 011, 110, 010 and 100 (6)



B/b	A/a	Phase
0	0	180°
0	1	+90°
1	0	0°
1	1	-90°

Present	Next	Phase	Output
101 (1)	101 (1)	0°	110
110 (3)	011 (4)	+90°	001
001 (1)	110 (3)	180°	100
100 (2)	010 (3)	+90°	001
001 (1)	100 (2)	+90°	101

2 Use the following constellation (ABCD) diagram and tables to determine the output of data received by a differential 16QAM system. The data is 1001, 0100, 0001, 0001, 1010 (ABCD) with default value 1001. (7)



Phase function (1)		
A/a	C/c	Phase
0	0	+90º
0	1	-90º
1	0	180º
1	1	0º

B-D function (2)			
Input		Output	
B/b	D/d	b/B	d/D
0	0	1	0
0	1	1	1
1	0	0	0
1	1	0	1

Present	Next	Phase	Q	Output
1001 (4)	1001	180º	2	0111
1001 (4)	0100	+90º	1	1010
0100 (3)	0001	+90º	4	1101
0001 (3)	0001	+90º	4	1101
0001 (3)	1010	0º	3	0100

3 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 3,72 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)

Channels = 12 x 8 x 11 x 3 = 3168 BW = 3168 x 3,72 kHz = 11,764 MHz
BW of cable = 12 MHz and it can fit
1 – close to limit of cable. 2 ch separation only 0,28 kHz with possible overlap of data

4 For a 40/42 TDM system using the same standards as a 30/32 system and a sampling frequency of 12 kHz with 12 bits slots, calculate:

- The frame duration.
- The multi-frame duration.
- The slot duration.
- The bit duration.
- The output gross line bit rate in bits/second. (6)

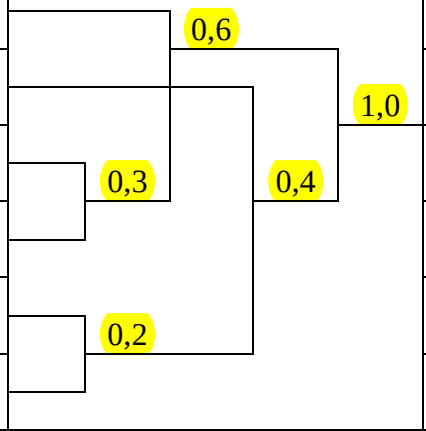
FD = 1/fs = 1/12 kHz = 83,33 µs
MFD = 83,33 x 21 = 1,75 ms
SD = 83,33/42 = 1,98 µs
BD = 1,98/12 = 165 ns
GLBR = 1/BD = 6,048 MHz

5 The following characters must be transmitted using Huffman coding. The count of each character is shown in the table.

Character	Count
P	30
Q	20
R	15
S	25
T	45
U	15

Determine: (a) The code for each character (b) The compression ratio (5)

Chr	Cnt	P(x)		code	n	nP(x)
T	45	0,3		11	2	0,6
P	30	0,2		10	2	0,4
S	25	0,167		101	3	0,5
Q	20	0,133		001	3	0,4
R	15	0,1		100	3	0,3
U	15	0,1		000	3	0,3
	150	1		HA		2,5



CR = Std/HA = 3/2,5 = 1,2

Total = 30