**Data Communication**

**Assignment I**V

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Question :

Find the guarantee correctness for codeword 6 bit and 7 bit

|  |  |  |  |
| --- | --- | --- | --- |
| Data | Codeword | Guarantee Correctness | BW effective |
| 2 | 5-bit | 87.5 % | 2/5 |
| 2 | 6-bit | … | 2/6 |
| 2 | 7-bit | … | 2/7 |

Answer :

For 5-bit :

Total possibility : 25 =32

According codeword validation:

24 = 100% guarantee

8 = 50% guarantee

Guarantee Correctness :

% = 87.5%

For 6-bit :

Total possibility : 26 =64

Suppose Valid Codeword = 000000 = 00 , 001111 = 01 , 011001 = 10 , 111110 = 11

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Invalid CodeWord | Minimum Distance | Valid Codeword | Invalid CodeWord | Minimum Distance | Valid Codeword |
| 000001 | 1 | 000000 | 100001 | 2 | 000000 |
| 000010 | 1 | 000000 | 100010 | 2 | 000000 |
| 000011 | 2 | 000000 or 001111 | 100011 | 3 | 000000 |
| 000100 | 1 | 000000 | 100100 | 2 | 000000 |
| 000101 | 2 | 000000 or 001111 | 100101 | 3 | 000000 or 001111 |
| 000110 | 2 | 000000 or 001111 | 100110 | 3 | 000000 or 001111 |
| 000111 | 1 | 001111 | 100111 | 2 | 001111 |
| 001000 | 1 | 000000 | 101000 | 2 | 000000 |
| 001001 | 2 | 000000 or 001111 | 101001 | 2 | 011001 |
| 001010 | 2 | 000000 or 001111 | 101010 | 2 | 111110 |
| 001011 | 1 | 001111 | 101011 | 2 | 001111 |
| 001100 | 2 | 000000 or 001111 | 101100 | 2 | 111110 |
| 001101 | 1 | 001111 | 101101 | 2 | 001111 |
| 001110 | 1 | 001111 | 101110 | 1 | 111110 |
| 010000 | 1 | 000000 | 101111 | 2 | 111110 |
| 010001 | 2 | 000000 or 011001 | 110000 | 2 | 000000 |
| 010010 | 2 | 000000 | 110001 | 2 | 011001 |
| 010011 | 2 | 011001 | 110010 | 2 | 111110 |
| 010100 | 2 | 011001 or 000000 | 110011 | 3 | 011001 or 111110 |
| 010101 | 2 | 011001 | 110100 | 2 | 111110 |
| 010110 | 2 | 111110 | 110101 | 3 | 011001 or 111110 |
| 010111 | 2 | 001111 | 110110 | 1 | 111110 |
| 011000 | 1 | 011001 | 110111 | 2 | 111110 |
| 011010 | 2 | 011001 | 111000 | 2 | 011001 or 111110 |
| 011011 | 1 | 011001 | 111001 | 1 | 011001 |
| 011100 | 2 | 111100 | 111010 | 1 | 111110 |
| 011101 | 1 | 011001 | 111011 | 2 | 111110 |
| 011110 | 1 | 111110 | 111100 | 1 | 111110 |
| 011111 | 2 | 011001 or 111110 | 111101 | 2 | 111110 |
| 100000 | 1 | 000000 | 111111 | 1 | 111110 |

According codeword validation :

50 = 100% guarantee

14 = 50% guarantee

Guarantee Correctness :

% = 89.0625%

For 7-bit :

Total possibility : 27 =128

Suppose Valid Codeword = 0000000 = 00 , 0001111 = 01 , 0111001 = 10 , 1111110 = 11

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Invalid CodeWord | Minimum Distance | Valid Codeword | Invalid CodeWord | Minimum Distance | Valid Codeword |
| 0000001 | 1 | 000000 | 1000001 | 2 | 000000 |
| 0000010 | 1 | 000000 | 1000010 | 2 | 000000 |
| 0000011 | 2 | 0000000 or 0001111 | 1000011 | 3 | 000000 or 0001111 |
| 0000100 | 1 | 0000000 | 1000100 | 2 | 000000 |
| 0000101 | 2 | 0000000 or 0001111 | 1000101 | 3 | 000000 or 0001111 |
| 0000110 | 2 | 0000000 or 0001111 | 1000110 | 3 | 000000 or 0001111 |
| 0000111 | 1 | 0001111 | 1000111 | 2 | 0001111 |
| 0001000 | 1 | 0000000 | 1001000 | 2 | 0000000 |
| 0001001 | 2 | 0000000 or 0001111 | 1001001 | 2 | 0111001 |
| 0001010 | 2 | 0000000 or 0001111 | 1001010 | 3 | 000000 or 0001111 |
| 0001011 | 1 | 0001111 | 1001011 | 2 | 0001111 |
| 0001100 | 2 | 0000000 or 0001111 | 1001100 | 2 | 1111100 |
| 0001101 | 1 | 0001111 | 1001101 | 2 | 0001111 |
| 0001110 | 1 | 0001111 | 1001110 | 2 | 0001111 |
| 0010000 | 1 | 0000000 | 1001111 | 1 | 0001111 |
| 0010001 | 2 | 0000000 | 1010000 | 2 | 0000000 |
| 0010010 | 2 | 0000000 | 1010001 | 3 | 0000000 or 0111001 |
| 0010011 | 3 | 0000000 or 0001111 | 1010010 | 3 | 0000000 |
| 0010100 | 2 | 0000000 | 1010011 | 4 | ALL |
| 0010101 | 3 | 0000000 or 0001111 | 1010100 | 3 | 0000000 or 1111110 |
| 0010110 | 3 | 0000000 or 0001111 or 1111110 | 1010101 | 4 | ALL |
| 0010111 | 2 | 0001111 | 1010110 | 2 | 1111110 |
| 0011000 | 2 | 0000000 or 0111001 | 1010111 | 3 | 0001111 or 1111110 |
| 0011001 | 3 | 0000000 or 0001111 | 1011000 | 3 | 0111001 or 1111110 |
| 0011010 | 3 | ALL | 1011001 | 2 | 0111001 |
| 0011011 | 2 | 0001111 | 1011010 | 2 | 1111110 |
| 0011100 | 3 | 0000000 or 0001111 or 1111110 | 1011011 | 3 | 0001111 or 0111001 or 1111110 |
| 0011101 | 2 | 0001111 | 1011100 | 2 | 1111110 |
| 0011110 | 2 | 0001111 or 1111110 | 1011101 |  |  |
| 0011111 | 1 | 0001111 | 1011110 | 1 | 1111110 |
| 0100000 | 1 | 0000000 | 1011111 | 2 | 0001111 or 1111110 |
| 0100001 | 2 | 0000000 | 1100000 | 2 | 0000000 |
| 0100010 | 2 | 0000000 | 1100001 | 3 | 0000000 or 0001111 or 0111001 |
| 0100011 | 3 | 0000000 | 1100010 | 3 | 0000000 or 1111110 |
| 0100100 | 2 | 0000000 | 1100011 | 4 | ALL |
| 0100101 | 3 | 0000000 or 0001111 | 1100100 | 3 | 0000000 or 1111110 |
| 0100110 | 3 | 0000000 or 0001111 or 1111110 | 1100101 | 4 | ALL |
| 0100111 | 2 | 0001111 | 1100110 | 2 | 1111110 |
| 0101000 | 2 | 0000000 or 0111001 | 1100111 | 3 | 0001111 or 1111110 |
| 0101001 | 1 | 0111001 | 1101000 | 3 | 0000000 or 1111110 |
| 0101010 | 2 | 0111001 | 1101001 | 2 | 0111001 |
| 0101011 | 2 | 0001111 or 0111001 | 1101010 | 2 | 1111110 |
| 0101100 | 3 | ALL | 1101011 | 3 | 0001111 or 0111001 or 1111110 |
| 0101101 | 2 | 0111001 | 1101100 | 2 | 1111110 |
| 0101110 | 2 | 0001111 or 1111110 | 1101101 | 3 | 0001111 or 0111001 or 1111110 |
| 0101111 | 1 | 0001111 | 1101110 | 1 | 1111110 |
| 0110000 | 2 | 0000000 | 1101111 | 2 | 0001111 or 1111110 |
| 0110001 | 1 | 0111001 | 1110000 | 3 | 0000000 or 0111001 or 1111110 |
| 0110010 | 2 | 0111001 | 1110001 | 2 | 0111001 |
| 0110011 | 2 | 0111001 | 1110010 | 2 | 1111110 |
| 0110100 | 3 | 0000000 or 0111001 | 1110011 | 3 | 0111001 or 1111110 |
| 0110101 | 2 | 0111001 | 1110100 | 2 | 1111110 |
| 0110110 | 2 | 1111110 | 1110101 | 3 | 0111001 or 1111110 |
| 0110111 | 3 | 0001111 or 0111001 or 1111110 | 1110110 | 1 | 1111110 |
| 0111000 | 1 | 0111001 | 1110111 | 2 | 1111110 |
| 0111010 | 2 | 0111001 or 1111100 | 1111000 | 2 | 0111001 or 1111110 |
| 0111011 | 1 | 0111001 | 1111001 | 1 | 0111001 |
| 0111100 | 1 | 1111100 | 1111010 | 1 | 111110 |
| 0111101 | 1 | 0111001 | 1111011 | 2 | 0111001 or 1111110 |
| 0111110 | 1 | 1111110 | 1111100 | 1 | 111110 |
| 0111111 | 2 | 0001111 or 0111001 or 1111110 | 1111101 | 2 | 0111001 or 1111110 |
| 1000000 | 1 | 0000000 | 1111111 | 1 | 1111110 |

According codeword validation :

76 = 100% guarantee

36 = 50% guarantee

10 = 25% guarantee

6 = 0% guarantee

Guarantee Correctness :

% = 75.390625%