Binary Codes

EEE 2407

Binary Codes

Binary codes for the decimal digits

Decimal digit	(BCD) 8421	Excess-3	84-2-1	2421
0	0000	0011	0000	0000
1	0001	0100	0111	0001
2	0010	0101	0110	0010
3	0011	0110	0101	0011
4	0100	0111	0100	0100
5	0101	1000	1011	1011
6	0110	1001	1010	1100
7	0111	1010	1001	1101
8	1000	1011	1000	1110
9	1001	1100	1111	1111

GRAY CODE

Four-bit Gray code

Gray code	Decimal equivalent
0000	0
0001	1
0011	2
0010	3
0110	4
0111	5
0101	6
0100	7
1100	8
1101	9
1111	10
1110	11
1010	12
1011	13
1001	14
1000	15

Error Detection Code

Binary information can be transmitted from one location to another by electric wires or other communication medium. Any external noise introduced into the physical communication medium may change some of the bits from 0 to 1 or vice versa. The purpose of an error-detection code is to detect such bit-reversal errors. One of the most common ways to achieve error detection is by means of a *parity bit*. A parity bit is an extra bit included with a message to make the total number of 1's transmitted either odd or even. A message of four bits and a parity bit P are shown in Table 1-3. If an odd parity is adopted, the P bit is chosen such that the total number of 1's is odd in the five bits that constitute the message and P. If an even parity is adopted, the P bit is chosen so that the total number of 1's in the five bits is even. In a particular situation, one or the other parity is adopted, with even parity being more common.

Error Detection code

Parity bit

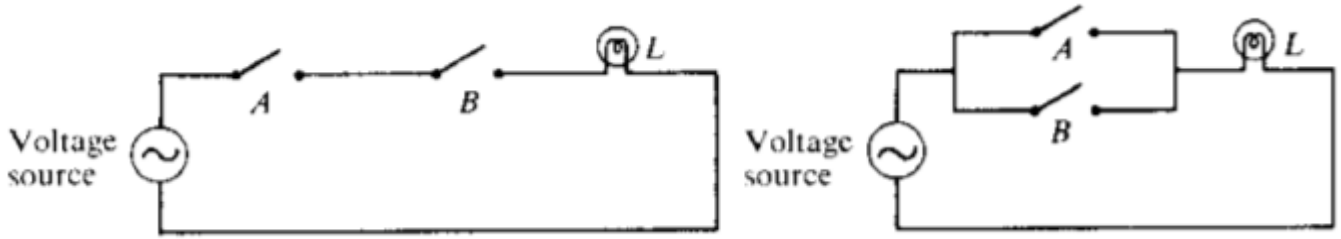
Odd parity		Even parity	
Message	*P*	Message	*P*
0000	1	0000	0
0001	0	0001	1
0010	0	0010	1
0011	1	0011	0
0100	0	0100	1
0101	1	0101	0
0110	1	0110	0
0111	0	0111	1
1000	0	1000	1
1001	1	1001	0
1010	1	1010	0
1011	0	1011	1
1100	1	1100	0
1101	0	1101	1
1110	0	1110	1
1111	1	1111	0

Problem…

The state of a 12-bit register is 010110010111. What is its content if it represents:
(a) three decimal digits in BCD;
(b) three decimal digits in the excess-3 code;
(c) three decimal digits in the 2421 code?

Switching circuits and Binary signal

Express the two circuits by means of binary logic



$$L = A \cdot B$$

$$L = A + B$$