Data ⇒ 1001 ⇒ 4bits ⇒ m=4

1# Find Number of parity Bits required.

Formula ⇒ $2^p \geq m+p+1$, p ⇒ No. of Parity Bits

Let p=2

$2^2 \geq 4+2+1$

X $4 \geq 7$

Let p=3

$2^3 \geq 4+3+1$

$8 \geq 8$ ✓

So, p=3

Total Code Bits ⇒ 4+3 = 7

2#

Bit Designation	P_1	P_2	M_1	P_3	M_2	M_3	M_4
Bit Position	1	2	3	4	5	6	7
Binary Position No.	001	010	011	100	101	110	111
Information Bits			1		0	0	1
Parity Bits	–	–		–			

3# Parity Bits are located in the position that are numbered corresponding to ascending power of two $(2^0, 2^1, 2^2, 2^3, 2^4)$ ⇒ 1, 2, 4, 8, 16

P_1 ⇒ checks bit Position 1, 3, 5 7, and must be 0, in order to have an even number of 1's.

1 3 5 7

⇓ ⇓ ⇓ ⇓ ⇒ Even. No. of 1s are there

P_1 1 0 1

So $P_1=0$

P_2 ⇒ checks Bit Position

2, 3 6 7

⇓ ⇓ ⇓ ⇓

P_2 1 0 1

$P_2=0$

P_3 ⇒ 4 5 6 7

⇓ ⇓ ⇓ ⇓

P_3 0 0 1

$P_3=1$

So Final Data 001100 1

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1 3 5 7

⇓ ⇓ ⇓ ⇓ ⇒ Even. No. of 1s are there

P_1 1 0 1

So $P_1=0$

P_2 ⇒ checks Bit Position

2, 3 6 7

⇓ ⇓ ⇓ ⇓

P_2 1 0 1

$P_2=0$

P_3 ⇒ 4 5 6 7

⇓ ⇓ ⇓ ⇓

P_3 0 0 1

$P_3=1$

So Final Data 001100 1

Receiver, Receive the Data ⇒ 0010001

Actual Data ⇒ 0011001

DETECTION and CORRECTION of ERROR

Bit Designation	P_1	P_2	M_1	P_3	M_2	M_3	M_4
Bit Position	1	2	3	4	5	6	7
Binary Position	001	010	011	100	101	110	111
Received code	0	0	1	0	0	0	1

First Parity check ⇒ 1 3 5 7

⇓ 1 0 1

0 All ready even, so parity bit Should be 0, and its 0.

Parity ⇒ Good ⟹ 0 (LSB)

Second Parity check ⇒ 2 3 6 7

⇓ 1 0 1 ✓

0

Good ⟹ 0

Third Parity check ⇒ 4 5 6 7

⇓ 0 0 1

0 should be 1 for making even parity

So Parity is Bad ⟹ 1 (MSB)

Error Position Code ⇒ 100

Binary = 4

It shows bit in number 4 position is in Error

It is a 0, should be 1.

Correct code is ⇒ 0011001