Supervisor's Name
Signature & Date
Roll No.

Pg./Suppl.No:
Date:

Hamming Correction and detection Code →

Ex: Sender Sends ASCII character H.
1001000 by applying hamming code Mechanism - Consider Even parity bit.

Message = 1001000
length = m = 7

* How Many R bits ⇒ No. of check bit r = 4

i.e $m + r + 1 \leq 2^r$ r is check bit.

$7 + 4 + 1 \leq 2^4$

$12 \leq 16$ True

So length of code word

$m + r = 7 + 4 = 11$

P_1	P_2	1	P_3	0	0	1	P_4	0	0	0
1	2	3	4	5	6	7	8	9	10	11

* position of check bit →

2^0	2^1	2^2	2^3
1	2	4	8

Now we check bit values using Even parity of check bit

Supervisor's Name _____
Signature & Date _____
Roll No. _____

Pg./Suppl.No:
Date:

Position of P_1 =

1, 3, 5, 7, 9, 11

? 1 0 1 0 0

To maintain even parity

We insert $P_1 = 0$

position of P_2 =

2, 3, 6, 7, 10, 11

? 1 0 1 0 0

Maintain Even parity

$P_2 = 0$

position of P_3 = 0

= 4, 5, 6, 7, ~~8, 9, 10~~

? 0 0 1

To satisfy Even parity

We Insert $P_3 = 1$

Position of P_4 =

8, 9, 10, 11

? 0 0 0 $P_4 = 0$

P_4	P_3	P_2	P_1	8 4 2 1
0	0	0	0	- 0
0	0	0	1	- 1
0	0	1	0	- 2
0	0	1	1	- 3
0	1	0	0	- 4
0	1	0	1	- 5
0	1	1	0	- 6
0	1	1	1	- 7
1	0	0	0	- 8
1	0	0	1	- 9
1	0	1	0	- 10
1	0	1	1	- 11
1	1	0	0	- 12
1	1	0	1	- 13
1	1	1	0	- 14
1	1	1	1	- 15

Supervisor's Name _____
Signature & Date _____
Roll No. _____

Pg./Suppl.No:
Date:

Now the Sender Sends
$m + r = 7 + 4 = 11$ Codeward is

P_1	P_2	D_1	P_3	D_2	D_3	D_4	P_4	D_5	D_6	D_7
0	0	1	1	0	0	1	0	0	0	0

Original Message Send by Sender ↑↑

Now at

Recive side →

At receiving End it applies hamming Code System to detect invalid checkbit.
To Identify which data bit is changed.

It Calculate Sum of all position of invalid check bit.

Supp. receive receives

0	0	1	1	0	1	1	0	0	0	0
1	2	3	4	5	6	7	8	9	10	11

position →

Now check bit position P_1

$P_1 = 1\ 3\ 5\ 7\ 9\ 11$

$0\ 1\ 0\ 1\ 0\ 0 =$ Even

Supervisor's Name _____
Signature & Date _____
Roll No. _____

Pg./Suppl.No:
Date:

P_2 = 2, 3, 6, 7, 10, 11

= 0 0 1 1 0 0 [odd] X

P_3 = 4, 5, 6, 7

1 0 1 1 [odd] X

P_4 = 8, 9, 10, 11

0 0 0 0 [Even] ✓

So there are two Invalid bits at position

$2^1, 2^2 = 2 + 4 = 6$

So the value of 6^{th} bit is invalid.

So Hamming Correction mechanism change it from 1 to 0.

i.e corrected code is

[0 0 1 1 0 0 1 0 0 0 0]

Supervisor's Name _____
Signature & Date _____
Roll No. _____

Pg./Suppl.No:
Date:

Example →

Calculate Hamming bit for data message 1001 assume Even parity.

$m = 4$

So

* How many parity bit

$$m + r + 1 \leq 2^r$$

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

$$8 \leq 8 \quad \text{True}$$

* position of bit

			2^0	2^1	2^2	
			1	2	4	
			1	0	0	1
P_1	P_2	D_1	P_3	D_2	D_3	D_4
1	2	3	4	5	6	7

$P_1 = 1, 3, 5, 7$

□ 1 0 1 $\quad C_1 = 0$ Even

$P_2 = 2, 3, 6, 7$

□ 1 0 1 $\quad C_2 = 0$ Even

$P_3 = 4\ 5\ 6\ 7$

$\square\ 0\ 0\ 1$ odd

$C_3 = 1$

Thus data Send by Sender :-

0 0 1 1 0 0 1

Receive Side → 1 2 3 4 5 6 7

0 0 1 1 0 0 1

Again check $P_1 = 1\ 3\ 5\ 7$

0 1 0 1 ≡ Even

$P_2 = 2, 3, 6, 7$

0 1 0 1 ≡ Even

$P_3 = 4, 5, 6, 7$

1 0 0 1 ≡ Even

No Error found.

Received code word is correct.