Ex No: 6
07/08/25

Error correction at Data Link layer

Aim:-

Write a Program to implement Error detection & Correction using Hamming code Concept.

Sender Program:

Apply Hamming Code concept on the binary data and add redundant bit to it.

```
def hamming_code(data):
    def insert_bits(data):
        m=len(data)
        r=0
        while(2**r)<(m+r+1):
            r+=1
        n=m+r
        result=['0']*n
        j=0
        for i in range(1,n+1):
            if i&(i-1)==0:
                continue
            result[-i]=data[-(j+1)]
            j+=1
            if j==m:
                break
        return result,n,r
    def calc_parity(pdata,r):
        n=len(pdata)
        result=pdata[:]
        for i in range(r):
            parity_val=0
            parity_pos=(2**i)
```

```
    for k in range (1, n+1):
        if k in parity_pos:
            parity_val = int (result [-k])
    result [parity_pos] = str(parity_val)
    return result
pbits, n, r = insert_bits(data)
code = calc_parity (pbits, r)
return ''.join(code)
input = input ("Enter binary data:")
print ("Hamming Code=", hamming_code(input))
```

Receiver Program::

→ Apply hamming code on the binary data to check for errors.

→ If there is any error display the position of the error.

```
def hamming_check (hamming_code):
    n=len (hamming_code)
    r=0
    while (2**r) < n+1:
        r+=1
    syn=0
    parity=[]
    for i in range(r):
        parity_pos = 2**i
        parity_val = 0
    for k in range (1, n+1):
        if k == parity_pos:
            parity_val = int (hamming_code[-k])
```

```
        parity.append(parity_val)
        syn = (parity_val << i)
    Synbits = ''.join(str(x) for x in reversed(parity))
    return Synbits, syn

Code = input("Enter Received Hamming Code: ")
res, error = hamming_check(code)
print("Error bits:", res)
if error == 0:
    print("No error detected")
else:
    print("Error detected at bit position:", error)
```

Output:

```
Enter binary data: 1001101
Hamming Code: 10011100101
Enter received Hamming Code: 10010100101
Error Syndrome bits: 0111
Error detected at bit position: 7
```

Result:

Sender and Receiver Program for hamming code concept was created and got the output.