

## ASSIGNMENT NO 3

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Roll No.:-66 'A'

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#include <stdio.h>

// Function to calculate parity bits
void generateHammingCode(int data[], int code[]) {
    // Place data bits at non-parity positions: 3,5,6,7,9,10,11 (1-based)
    code[2] = data[0];
    code[4] = data[1];
    code[5] = data[2];
    code[6] = data[3];
    code[8] = data[4];
    code[9] = data[5];
    code[10] = data[6];

    // Calculate parity bits at positions 1, 2, 4, and 8 (0-based: 0,1,3,7)
    code[0] = code[2] ^ code[4] ^ code[6] ^ code[8] ^ code[10];
    code[1] = code[2] ^ code[5] ^ code[6] ^ code[9] ^ code[10];
    code[3] = code[4] ^ code[5] ^ code[6];
    code[7] = code[8] ^ code[9] ^ code[10];
}

// Function to detect and correct single-bit errors
int detectAndCorrect(int code[]) {
    int p1 = code[0] ^ code[2] ^ code[4] ^ code[6] ^ code[8] ^ code[10];
    int p2 = code[1] ^ code[2] ^ code[5] ^ code[6] ^ code[9] ^ code[10];
    int p4 = code[3] ^ code[4] ^ code[5] ^ code[6];
    int p8 = code[7] ^ code[8] ^ code[9] ^ code[10];

    int errorPos = p8 * 8 + p4 * 4 + p2 * 2 + p1 * 1;
```

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        return errorPos;
    }

int main() {
    int data[7];
    int code[11] = {0};

    printf("SENDER SIDE:\n");
    printf("Enter 7 data bits (space-separated, e.g., 1 0 1 1 0 0 1): ");
    for (int i = 0; i < 7; i++) {
        scanf("%d", &data[i]);
    }

    generateHammingCode(data, code);

    printf("Generated 11-bit Hamming Code (to send): ");
    for (int i = 0; i < 11; i++) {
        printf("%d ", code[i]);
    }

    printf("\n\nRECEIVER SIDE:\n");
    int receivedCode[11];
    printf("Enter the 11-bit Hamming code received (space-separated): ");
    for (int i = 0; i < 11; i++) {
        scanf("%d", &receivedCode[i]);
    }

    int errorPos = detectAndCorrect(receivedCode);
    if (errorPos == 0) {
        printf("\nNo error detected in received data.\n");
    } else {

```

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printf("\nError detected at position: %d\n", errorPos);

receivedCode[errorPos - 1] ^= 1; // Correct the error

printf("Corrected Code: ");

for (int i = 0; i < 11; i++) {

    printf("%d ", receivedCode[i]);

}

printf("\n");

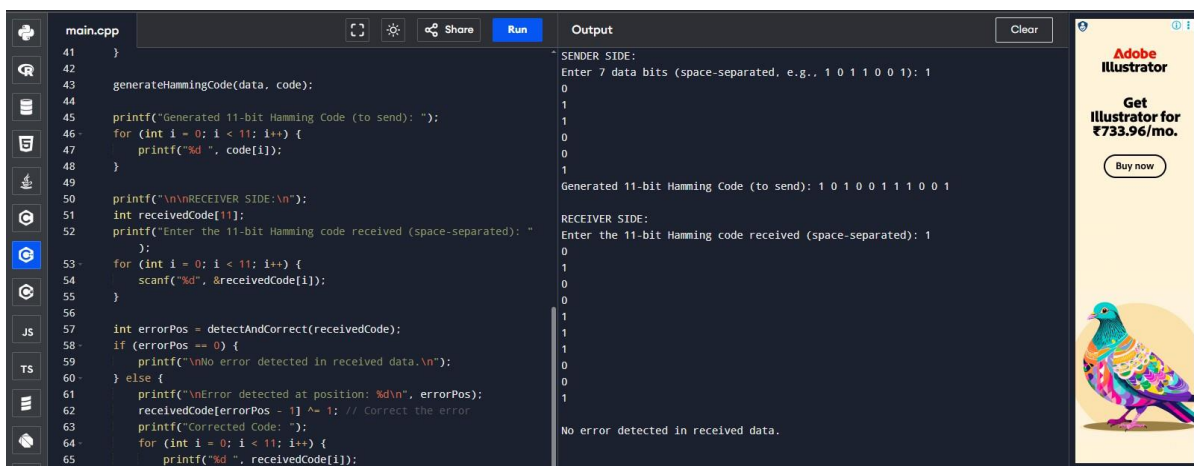
}

return 0;

}

```

## OUTPUT:-



```

main.cpp
41 }
42
43 generateHammingCode(data, code);
44
45 printf("Generated 11-bit Hamming Code (to send): ");
46 for (int i = 0; i < 11; i++) {
47     printf("%d ", code[i]);
48 }
49
50 printf("\n\nRECEIVER SIDE:\n");
51 int receivedCode[11];
52 printf("Enter the 11-bit Hamming code received (space-separated): ");
53
54 for (int i = 0; i < 11; i++) {
55     scanf("%d", &receivedCode[i]);
56 }
57
58 int errorPos = detectAndCorrect(receivedCode);
59 if (errorPos == 0) {
60     printf("\nNo error detected in received data.\n");
61 } else {
62     printf("\nError detected at position: %d\n", errorPos);
63     receivedCode[errorPos - 1] ^= 1; // Correct the error
64     printf("Corrected Code: ");
65     for (int i = 0; i < 11; i++) {
66         printf("%d ", receivedCode[i]);
67     }
68     printf("\n");
69 }
70
71 return 0;
72 }

```

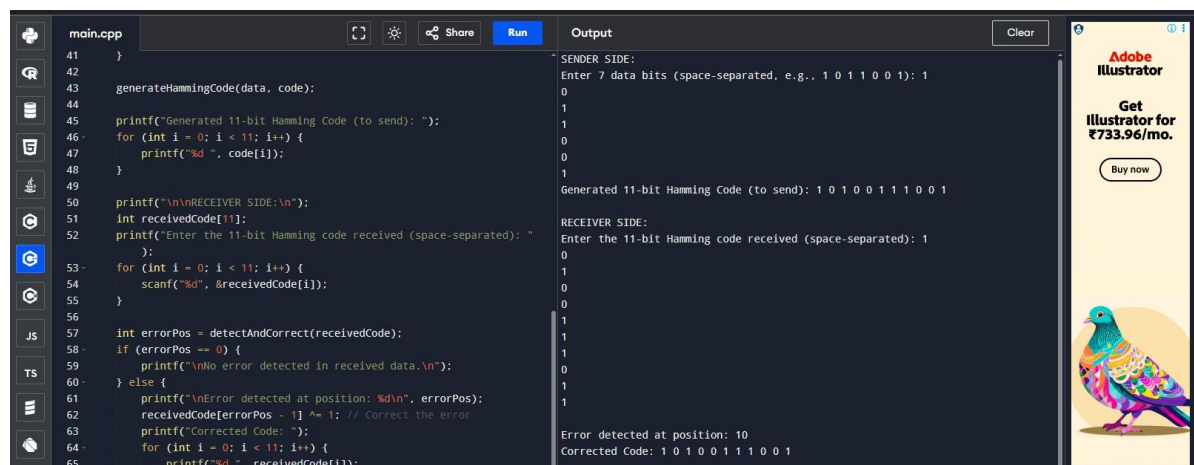
Output

```

SENDER SIDE:
Enter 7 data bits (space-separated, e.g.. 1 0 1 1 0 0 1): 1
0
1
1
0
0
0
1
Generated 11-bit Hamming Code (to send): 1 0 1 0 0 1 1 1 0 0 1

RECEIVER SIDE:
Enter the 11-bit Hamming code received (space-separated): 1
0
1
1
0
0
0
1
1
1
0
0
1
No error detected in received data.

```



```

main.cpp
41 }
42
43 generateHammingCode(data, code);
44
45 printf("Generated 11-bit Hamming Code (to send): ");
46 for (int i = 0; i < 11; i++) {
47     printf("%d ", code[i]);
48 }
49
50 printf("\n\nRECEIVER SIDE:\n");
51 int receivedCode[11];
52 printf("Enter the 11-bit Hamming code received (space-separated): ");
53
54 for (int i = 0; i < 11; i++) {
55     scanf("%d", &receivedCode[i]);
56 }
57
58 int errorPos = detectAndCorrect(receivedCode);
59 if (errorPos == 0) {
60     printf("\nNo error detected in received data.\n");
61 } else {
62     printf("\nError detected at position: %d\n", errorPos);
63     receivedCode[errorPos - 1] ^= 1; // Correct the error
64     printf("Corrected Code: ");
65     for (int i = 0; i < 11; i++) {
66         printf("%d ", receivedCode[i]);
67     }
68     printf("\n");
69 }
70
71 return 0;
72 }

```

Output

```

SENDER SIDE:
Enter 7 data bits (space-separated, e.g.. 1 0 1 1 0 0 1): 1
0
1
1
0
0
0
1
Generated 11-bit Hamming Code (to send): 1 0 1 0 0 1 1 1 0 0 1

RECEIVER SIDE:
Enter the 11-bit Hamming code received (space-separated): 1
0
1
1
0
0
0
1
1
1
0
0
1
Error detected at position: 10
Corrected Code: 1 0 1 0 0 1 1 1 0 0 1

```