

```

#include <stdio.h>

#include <string.h>

#include <stdlib.h>

int main() {
    char rem[50], a[50], s[50], c, msj[50], gen[30];

    int i, genlen, t, j, flag = 0, k, n;

    printf("Enter the generator polynomial (in binary): ");
    fgets(gen, sizeof(gen), stdin);
    gen[strcspn(gen, "\n")] = '\0'; // remove newline

    printf("Generator polynomial (CRC-CCITT) is: %s\n", gen);
    genlen = strlen(gen);
    k = genlen - 1;

    printf("Enter the message (in binary): ");
    fgets(msj, sizeof(msj), stdin);
    msj[strcspn(msj, "\n")] = '\0'; // remove newline

    n = strlen(msj);

    // Copy message and append k zeros
    strcpy(a, msj);
    for (i = 0; i < k; i++)
        a[n + i] = '0';
    a[n + k] = '\0';

    printf("\nMessage polynomial appended with zeros:\n");

```

```
puts(a);
```

```
// Division (XOR operation)
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for (i = 0; i < n; i++) {
```

```
    if (a[i] == '1') {
```

```
        t = i;
```

```
        for (j = 0; j < genlen; j++) {
```

```
            // XOR operation between bits
```

```
            a[t] = (a[t] == gen[j]) ? '0' : '1';
```

```
            t++;
```

```
        }
```

```
    }
```

```
}
```

```
// Remainder (Checksum)
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```
for (i = 0; i < k; i++)
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```
    rem[i] = a[n + i];
```

```
rem[k] = '\0';
```

```
printf("The checksum (remainder) is:\n");
```

```
puts(rem);
```

```
// Append remainder to original message
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```
strcpy(a, msj);
```

```
strcat(a, rem);
```

```
printf("\nThe transmitted message (message + checksum):\n");
```

```
puts(a);
```

```

// Receiver side

printf("\nEnter the received message: ");

fgets(s, sizeof(s), stdin);

s[strcspn(s, "\n")] = '\0';

n = strlen(s);

// Perform division again
for (i = 0; i < n - k; i++) {
    if (s[i] == '1') {
        t = i;
        for (j = 0; j < genlen; j++) {
            s[t] = (s[t] == gen[j]) ? '0' : '1';
            t++;
        }
    }
}

// Extract remainder from received message
for (i = n - k; i < n; i++) {
    if (s[i] == '1')
        flag = 1;
}

if (flag == 0)
    printf("\nReceived polynomial is error-free \n");
else
    printf("\nReceived polynomial contains an error \n");

```

```
    return 0;  
}
```

Output

```
Enter the generator polynomial (in binary): 101  
Generator polynomial (CRC-CCITT) is: 101  
Enter the message (in binary): 110101  
  
Message polynomial appended with zeros:  
11010100  
The checksum (remainder) is:  
11  
  
The transmitted message (message + checksum):  
11010111  
  
Enter the received message: 11110111  
  
Received polynomial contains an error
```