EN2091 Laboratory Practice and Projects
Communication Systems and Networks - Workshop 2
Task Sheet

Index No.: 200398D **Group No.:** 30

Date: 2022.12.15

Task 1.

```
>> task1
your codeword is 1010011110101
>>
```

output ⇑

code. ⇒

```
message = 0b101001111u32;
divisor = 0b10111u32;

messageLength=strlength (dec2bin(message));
divisorDegree = strlength (dec2bin(divisor))-1;


divisor = bitshift(divisor,messageLength-1);
remainder = bitshift(message,divisorDegree);

    for k = 1:messageLength
        if bitget(remainder,messageLength+divisorDegree)
            remainder = bitxor(remainder,divisor);
        end
        remainder = bitshift(remainder,1);
    end


CRC_check_value = bitshift(remainder,-messageLength);
newmessage=bitshift(message,divisorDegree);

codeword=bitor(newmessage,CRC_check_value);

disp("your codeword is "+ dec2bin(codeword))
```

Task 2.

```
>> Task_2
syndrome  0
Message is error free.
```

output.

code ⇒

```
codeword= 0b10100111101101u32;
divisor = 0b10111u32;

codelength=strlength(dec2bin(codeword));
divisordegree = strlength(dec2bin(divisor))-1;


remainder=codeword;
divisor=bitshift(divisor,(codelength-divisordegree-1));
for k = 1:(codelength-divisordegree)
    if bitget(remainder,codelength)
        remainder = bitxor(remainder,divisor);
    end
    remainder = bitshift(remainder,1);
end
syndrome=bitshift(remainder,-(codelength-divisordegree));
disp("syndrome  "+ dec2bin(syndrome))
if syndrome == 0
    disp('Message is error free.')
else
    disp('Message contains errors.')
end
```

Task 3.

```
>> task3
tranmistted is 1010011110101
receiced is    111100
syndrome at receiver = 101
```

output

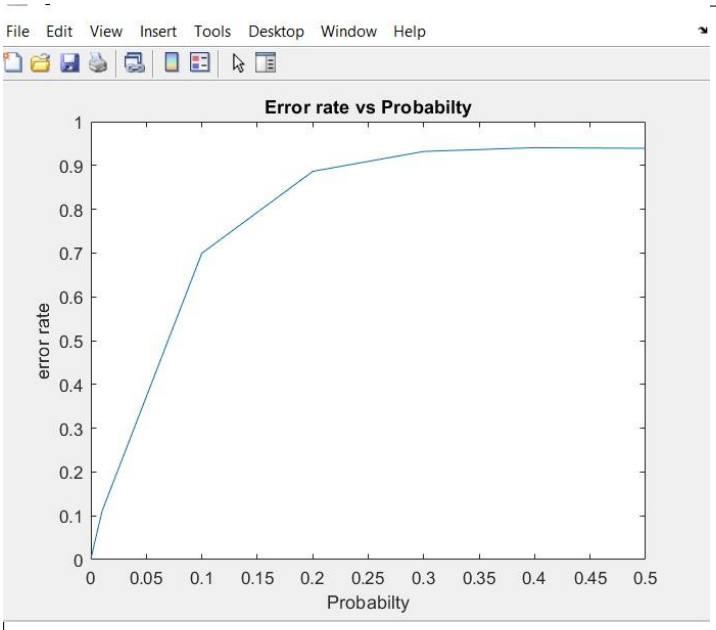
Code. ⇒

```
codeword= 0b1010011110101u32;
divisor = 0b10111u32;
transmitted=codeword;

codeword=dec2bin(codeword);
codeword=num2cell(codeword);
codeword = str2double(codeword);

probability=0.5;

received= bsc(codeword,probability);
received = num2str(received);
received = received(~isspace(received));
received = bin2dec(received);
disp("tranmistted is "+ dec2bin(transmitted));
disp("receiced is    "+ dec2bin(received ));



syndrome = decode_1(received, divisor);
disp("syndrome at receiver = " + dec2bin(syndrome));
```

⇒ now syndrome = 0101

This is not 0000, because now the message is transmitted through binary symmetric channel (BSC) which has an error probability of 0.5. due to that some errors can be occured at transmitted codeword. that's why syndrome is not zero [Received codeword contain some error bits).

Task 4.



← plot (error rate) vs probability

```
>> task4
Error probability = 0.500000, Error rate = 0.939100
Error probability = 0.400000, Error rate = 0.940600
Error probability = 0.300000, Error rate = 0.932000
Error probability = 0.200000, Error rate = 0.886500
Error probability = 0.100000, Error rate = 0.699500
Error probability = 0.010000, Error rate = 0.109800
Error probability = 0.001000, Error rate = 0.012500
Error probability = 0.000100, Error rate = 0.001500
```

← (output from code)