**American International University – Bangladesh**

**Data Communication – Final Term LAB Assignment [Total - 30]**

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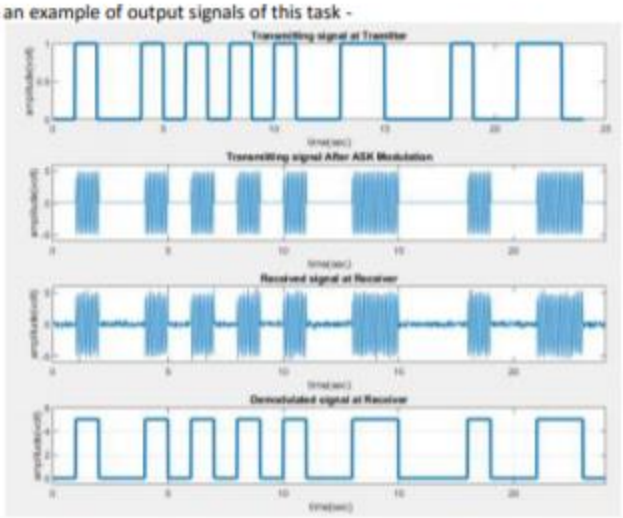
|---|---|---|

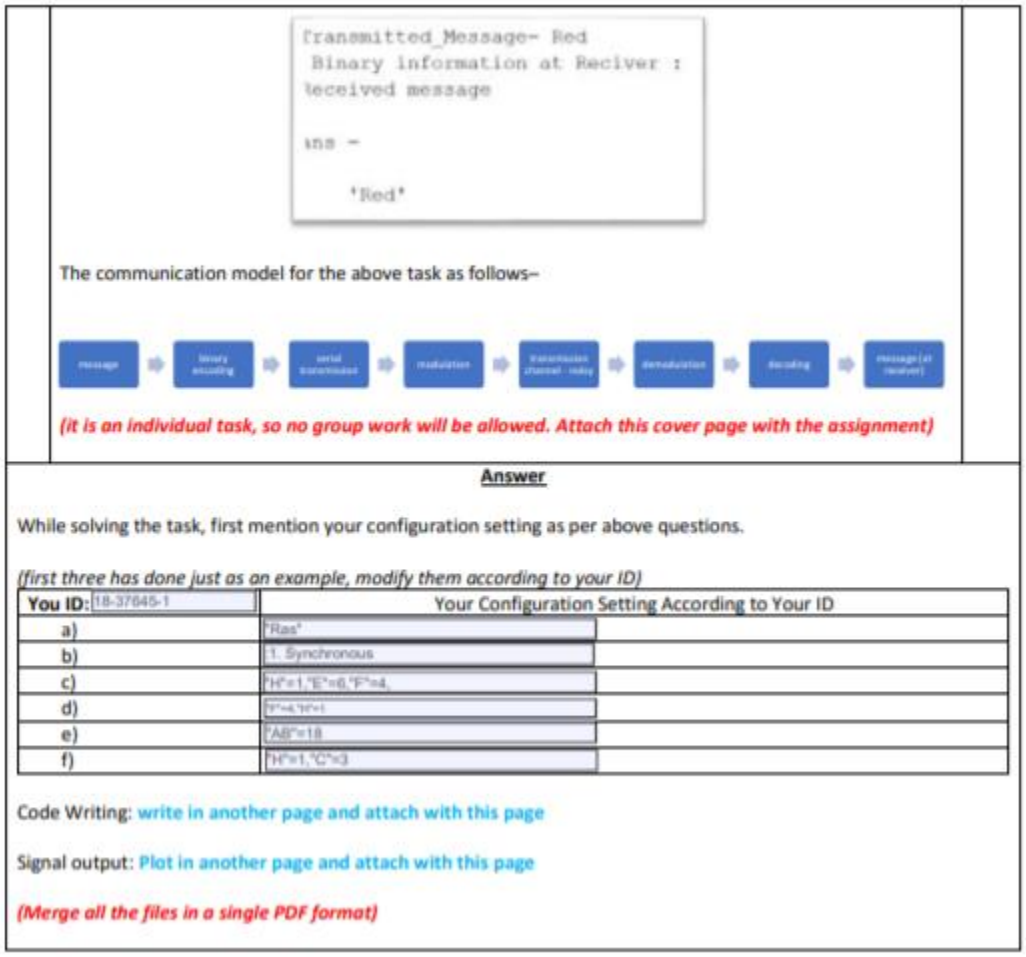
**Answer All the Questions**

1. Suppose you need to build a data communication model, where the sender will send a message (m) and the receiver needs to receive it correctly through a noisy channel. Do the configuration according to the following instructions and your ID format: **AB-CDEFG-H**

   a) The message signal – first three letters of your name
   b) The message will be transmitted in either form – 1. Synchronous 2. Asynchronous (i.e. if the value of "B" of your ID is even then 1 otherwise 2)
   c) Plot the digital signal according to the bit stream received from step b. Use the value of "H" as bit duration of the signal. The amplitude of the digital signal will be as the value of "C"
      Do the modulation of the transmitting data from step b in either way – 1. ASK 2. FSK (i.e. if the value of "E" of your ID is even then 1 otherwise 2). During modulation the message & carrier signal should in one of either type – 1. sin 2. Cos. (i.e. if the value of "F" of your ID is even then 1 otherwise 2)
   d) The amplitude of the message signal is equal to the value of "F" and the amplitude of the carrier signal is equal to the value of "H"
   e) You should use Additive white Gaussian noise (AWGN) as noise where the SNR value is as "AB"
   f) After the demodulation, plot the digital signal with same amplitude as the transmission side.
   g) Show the received message after decoding the received bits.

   The following is an example of output signals of this task -





```
Transmitted_Message- Red
 Binary information at Reciver :
Received message

ans =

    'Red'
```

The communication model for the above task as follows–

*(it is an individual task, so no group work will be allowed. Attach this cover page with the assignment)*

**Answer**

While solving the task, first mention your configuration setting as per above questions.

*(first three has done just as an example, modify them according to your ID)*

| **You ID:** 18-37645-1 | Your Configuration Setting According to Your ID |
|---|---|
| a) | "Ras" |
| b) | 1. Synchronous |
| c) | "H"=1,"E"=6,"F"=4, |
| d) | "F"=4,"H"=1 |
| e) | "AB"=18 |
| f) | "H"=1,"C"=3 |

Code Writing: write in another page and attach with this page

Signal output: Plot in another page and attach with this page

*(Merge all the files in a single PDF format)*

Id: 18-37645-1

A=1,B=8,C=3,D=7,E=6,F=4,G=5,H=1

(a) The message signal is first three letters of my name: “Ras”.

(b) The value of B is 8,Which is even.So synchronous transmission has to be applied:

Code:

```
function dn= as2bn(txt)

dec=double(txt)
p2=2.^(0:-1:-7);
B=mod(floor(p2'*dec),2);
dn=reshape(B,1,numel(B));
```

```
end
```

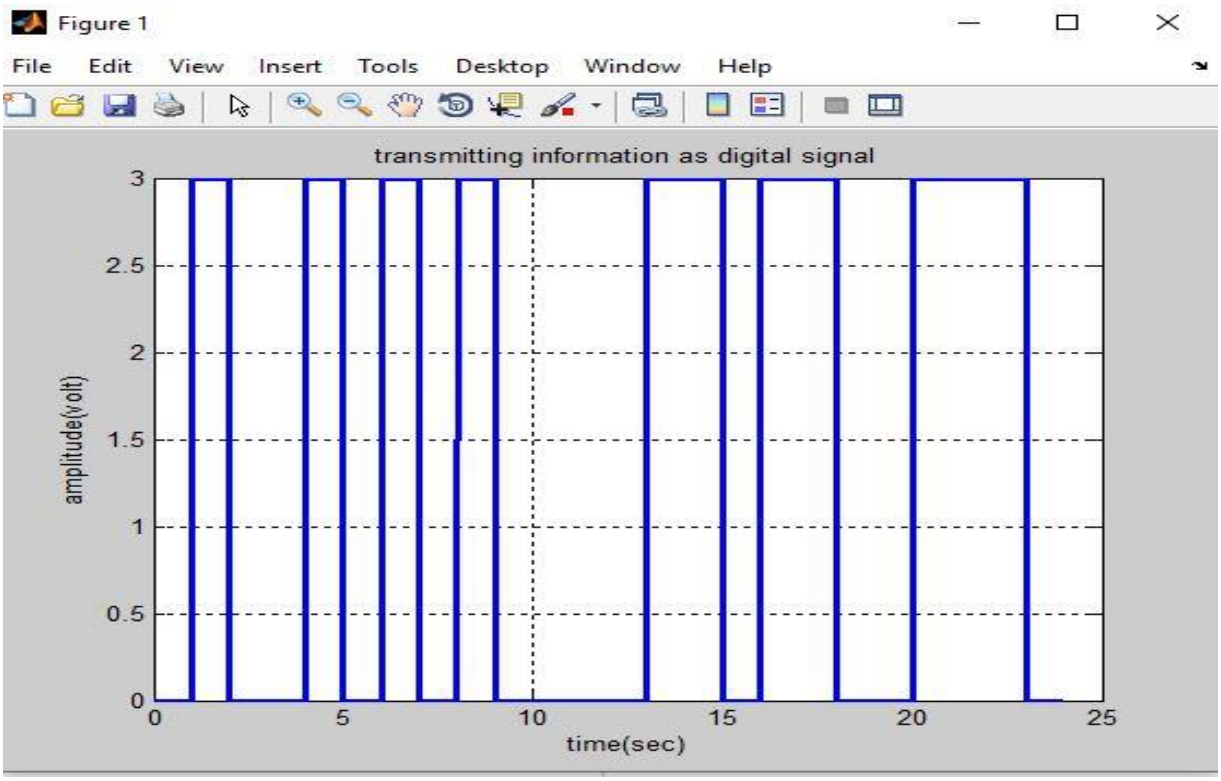
```
>> as2bn('Ras')

dec =

    82    97   115


ans =

  Columns 1 through 15

     0     1     0     0     1     0     1     0     1     0     0     0     0     1     1

  Columns 16 through 24

     0     1     1     0     0     1     1     1     0

>>
```

(c) Bit duration H=1
Amplitude C=3
Value of bit duration=H=1

Code of digital signal:

```
x= as2bn('Ras');
bp=1;
bit=[]
for n=1:1:length(x)
    if x(n)==1;
        se=3*(ones(1,100));  (Here 3 is tha amplitude)
    else x(n)==0;
        se=zeros(1,100);
```

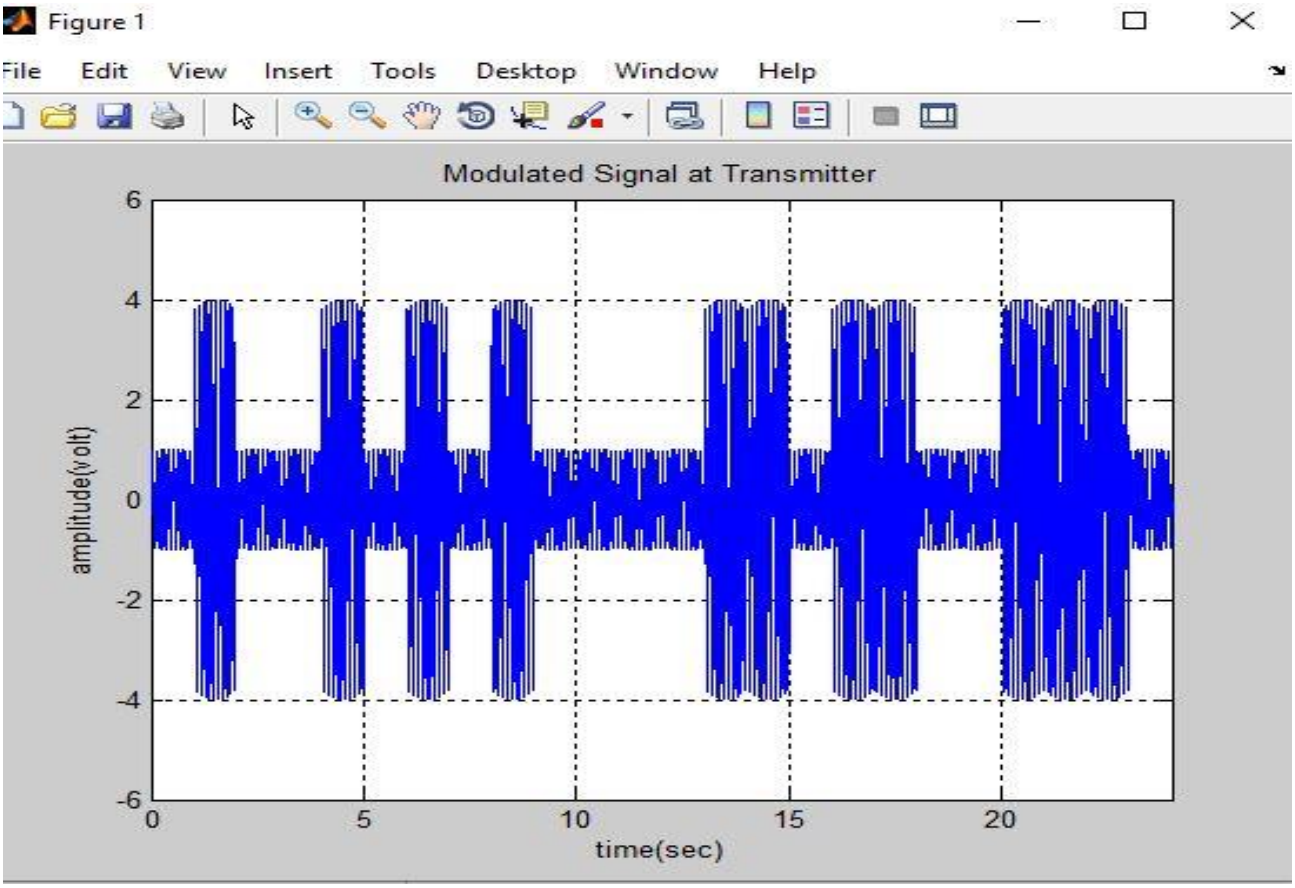
```
    end
    bit=[bit se];
end
t1=bp/100:bp/100:100*length(x)*(bp/100);
subplot(1,1,1);
plot(t1,bit,'linewidth',2.5);
grid on;
ylabel('amplitude(volt)');
xlabel('time(sec)');
title('transmitting information as digital signal');

hold on;
Output:
```




Code of ASK modulation: (F=4,H=1)

```
A1=4; % Amplitude of message signal (message signal F=4)
A2=1; % Amplitude of carrier signal (carrier  signal H=1)
br=1/bp; % bit rate
f=br*10; % carrier frequency
t2=bp/99:bp/99:bp;
ss=length(t2);
m=[];
for (i=1:1:length(x))
 if (x(i)==1)
 y=A1*sin(2*pi*f*t2);
 else
 y=A2*sin(2*pi*f*t2);
 end
 m=[m y];
end
```

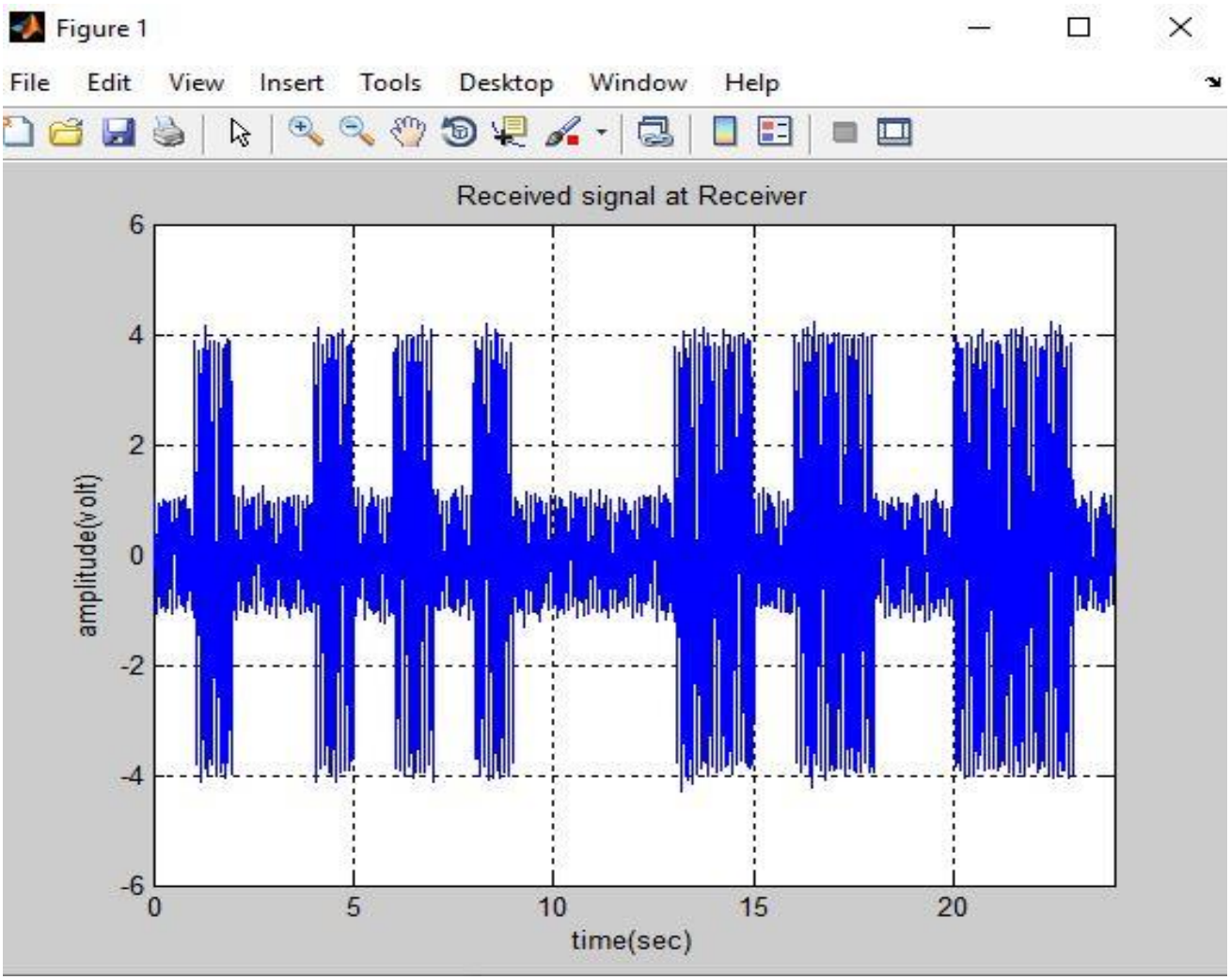
```
t3=bp/99:bp/99:bp*length(x);
subplot(1,1,1);
plot(t3,m);
grid on;
axis([ 0 bp*length(x) -6 6]);
xlabel('time(sec)');
ylabel('amplitude(volt)');
title('Modulated Signal at Transmitter');
```




e.

Code of adding noise:

```
t4=bp/99:bp/99:bp*length(x);
mr=awgn(m,18); %adding AWGN noise (SNR=AB=1)
subplot(1,1,1);
plot(t4,mr);
grid on;
axis([ 0 bp*length(x) -6 6]);
xlabel('time(sec)');
ylabel('amplitude(volt)');
title('Received signal at Receiver');
```




f.

Code of demodulation:

```
mn=[];
for n=ss:ss:length(mr)
 t=bp/99:bp/99:bp;
 y=cos(2*pi*f*t); % carrier signal
 mm=y.*mr((n-(ss-1)):n);
 t5=bp/99:bp/99:bp;
 z=trapz(t5,mm) ; % integration
 zz=round((2*z/bp));
 if(zz>2.5) % logic level = (A1+A2)/2=2.5
 a=1;
 else
 a=0;
```

```
 end
 mn=[mn a];
end
```

/// Displaying the demodulated signal

```
bit=[];
for n=1:length(mn);
 if mn(n)==1;
 se=3*ones(1,100);
 else mn(n)==0;
 se=zeros(1,100);
 end
 bit=[bit se];
end
t5=bp/100:bp/100:100*length(x)*(bp/100); (t5=t1)
subplot(1,1,1)
plot(t5,bit,'LineWidth',2.5);grid on;
axis([ 0 bp*length(mn) -.5 6]);
ylabel('amplitude(volt)');
xlabel(' time(sec)');
title('Demodulated signal at Receiver');
```

(g) Code of Binary to Ascii:

```
function txt = bin2asc(dn)

L=length(dn);
L8=8*floor(L/8);
B=reshape(dn(1:L8),8,L8/8);
p2=2.^(0:7);
dec=p2*B;
txt=char(dec);

end
```