

**American International University- Bangladesh**

**COE 3103: DATA COMMUNICATION**

**Mid Lab Report 04**

**Spring 2021-2022**

**Section: Q**

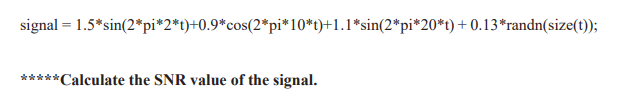
**Date: 14/03/2022**

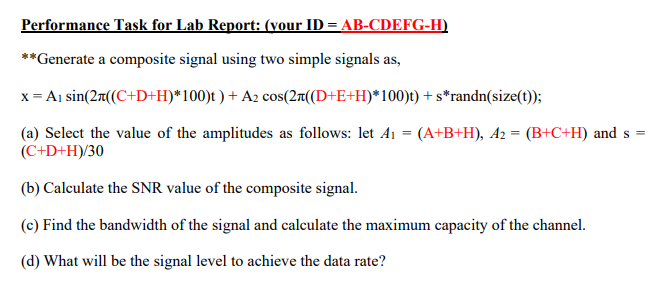
**Submitted by,**

|  |  |
| --- | --- |
| Student Name | Student Id |
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**Tasks**

**Class Task:**





**Solution of Class Task**

fs = 8000; % Sampling frequency

%Define signal

t = 0:1/fs:1-1/fs;

signal = 1.5\*sin(2\*pi\*2\*t)+0.9\*cos(2\*pi\*10\*t)+1.1\*sin(2\*pi\*20\*t) + 0.13\*randn(size(t));

%snr

SNR = snr(signal)

Output:

SNR =

1.4244

**Solution of Performance Task (a)**

%ID: 19-41468-3

A = 1;

B = 9;

C = 4;

D = 1;

E = 4;

F = 6;

G = 8;

H = 3;

A1 = (A+B+H)

A2 = (B+C+H)

s =(C+D+H)/30

Output:

A1 =

13

A2 =

16

s =

0.2667

**Solution of Performance Task (b)**

%ID: 19-41468-3

A = 1;

B = 9;

C = 4;

D = 1;

E = 4;

F = 6;

G = 8;

H = 3;

A1 = (A+B+H); %A1 = 13

A2 = (B+C+H); %A2 = 16

s =(C+D+H)/30; %s = 0.2667

fs = 8000; % Sampling frequency

%Define signal

t = 0:1/fs:1-1/fs;

x = A1\*sin(2\*pi\*((C+D+H)\*100)\*t) + A2\*cos(2\*pi\*((D+E+H)\*100)\*t) + s\*randn(size(t));

%snr

SNR = snr(x)

Output:

SNR =

34.6128

**Solution of Performance Task (c)**

%ID: 19-41468-3

A = 1;

B = 9;

C = 4;

D = 1;

E = 4;

F = 6;

G = 8;

H = 3;

A1 = (A+B+H); %A1 = 13

A2 = (B+C+H); %A2 = 16

s =(C+D+H)/30; %s = 0.2667

fs = 8000; % Sampling frequency

%Define signal

t = 0:1/fs:1-1/fs;

x = A1\*sin(2\*pi\*((C+D+H)\*100)\*t) + A2\*cos(2\*pi\*((D+E+H)\*100)\*t) + s\*randn(size(t));

%snr

SNR = snr(x);

Bandwidth = obw(x,fs) % Bandwidth of the signal

Capacity = Bandwidth\*log2(1+SNR) % Capacity of the channel

Output:

Bandwidth =

0.9903

Capacity =

5.1103

**Solution of Performance Task (d)**

%ID: 19-41468-3

A = 1;

B = 9;

C = 4;

D = 1;

E = 4;

F = 6;

G = 8;

H = 3;

A1 = (A+B+H); %A1 = 13

A2 = (B+C+H); %A2 = 16

s =(C+D+H)/30; %s = 0.2667

fs = 8000; % Sampling frequency

%Define signal

t = 0:1/fs:1-1/fs;

x = A1\*sin(2\*pi\*((C+D+H)\*100)\*t) + A2\*cos(2\*pi\*((D+E+H)\*100)\*t) + s\*randn(size(t));

%snr

SNR = snr(x);

Bandwidth = obw(x,fs); % Bandwidth of the signal

Capacity = Bandwidth\*log2(1+SNR); % Capacity of the channel

Level = floor(2^(Capacity/(2\*Bandwidth))) %signal level to achieve the data rate

Output:

Level =

5