Lab Report

IA 3203 – DIGITAL SIGNAL PROCESSING

Department of Instrumentation and Automation Technology
University of Colombo

DSP 304 – – Analog to Digital Conversion

Registration No: 2021t01108

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Date (dd/mm/yy): 1/11/2024

Exercise:

Question 01.a:

Answer:

Octave code:

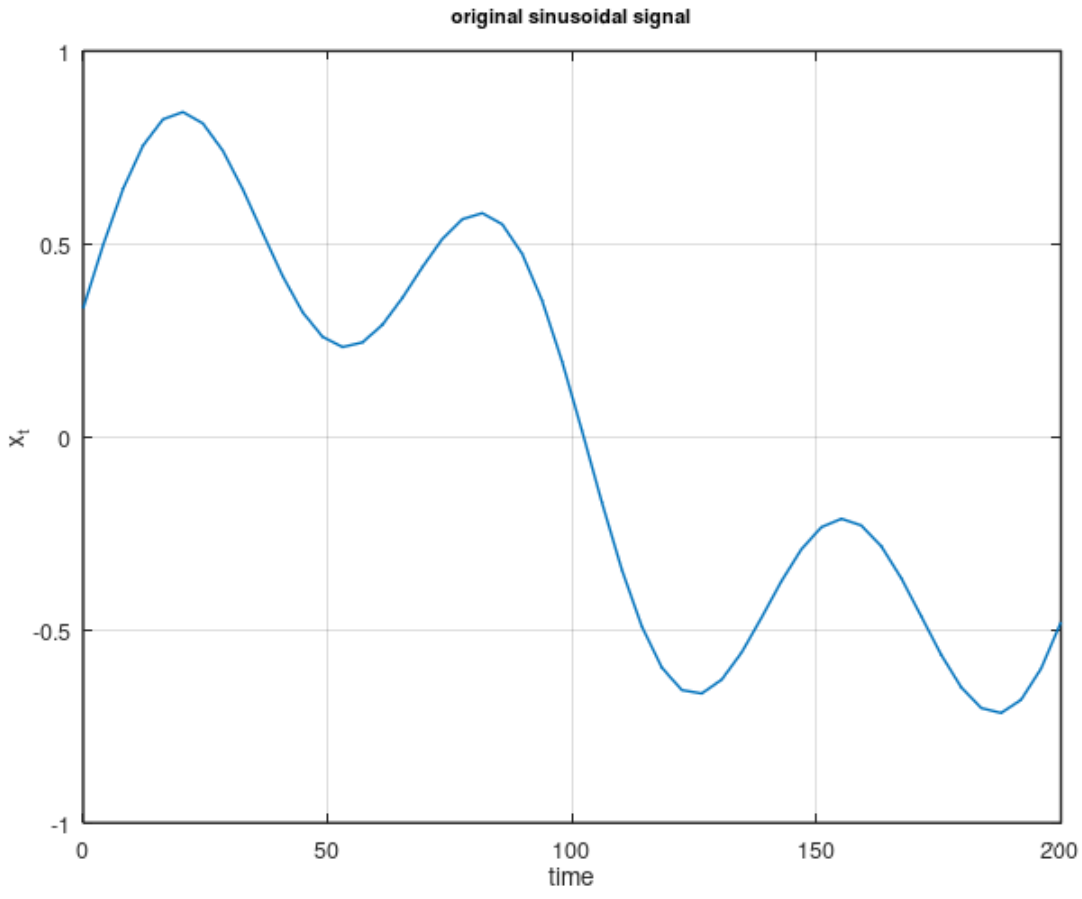
q1.m

```
close all;
clear all;
clc;

%a.Plot the original sinusoidal signal.
f = 50;
t = linspace(0, 200 , f);
x = 1/3*[sin(t/11)+sin(t/31)+cos(t/67)];
plot(t, x);
x_label('t');
y_label('x');
title('original signal');

```

Figures:



Question 01.b:

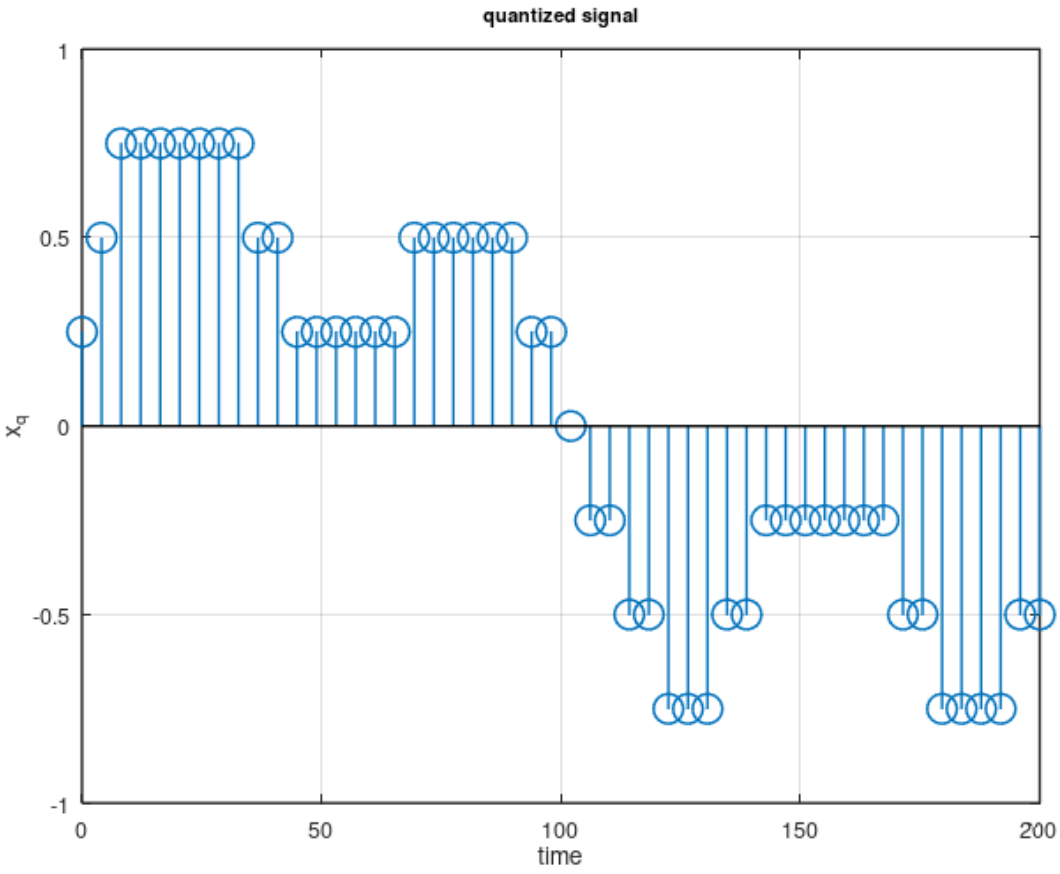
Answer:

Octave code:

```
%b.Get the quantized signal by rounding off the given signal with respect to 2
%bits and plot your result

f = 50;
t = linspace(0, 200 , f);
x_t = 1/3*[sin(t/11)+sin(t/31)+cos(t/67)];
x_q = round(x_t * 2^2)/2^2; %2bits --> 2 levels
stem(t, x_q);
xlabel('time');
ylabel('x_q');
title('quantized signal');
grid on
```

Figures:



Question 01.c:

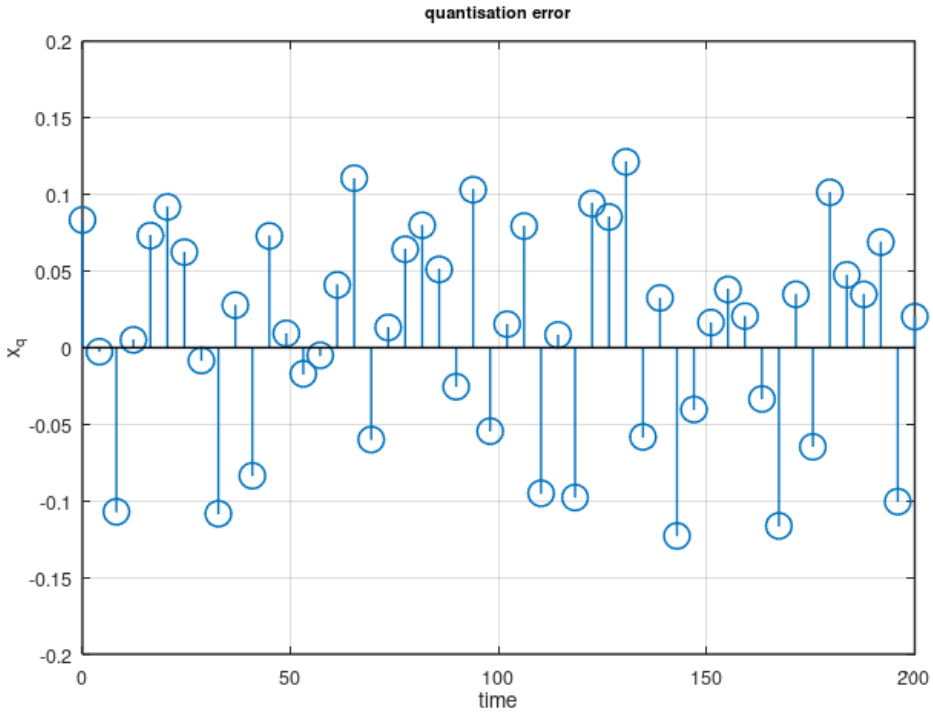
Answer:

Octave code:

```
%quantation error

f = 50;
t = linspace(0, 200 , f);
x_t = 1/3*[sin(t/11)+sin(t/31)+cos(t/67)];
x_q = round(x_t * 2^2)/2^2; %2bits --> 2 levels
q_error = (x_t-x_q);
stem(t, q_error);
xlabel('time');
ylabel('x_q');
title('quantisation error');
grid on
```

Figures




```
Command Window
 Columns 1 through 11:

   8.3333e-02  -2.6561e-03  -1.0709e-01   5.0853e-03   7.3121e-02   9.1856e-02   6.2333e-02  -8.4082e-03  -1.0836e-01   2.7761e-02  -8.3596e-02

 Columns 12 through 22:

   7.2892e-02   9.3239e-03  -1.7086e-02  -4.9878e-03   4.0932e-02   1.1062e-01  -5.9958e-02   1.3182e-02   6.4238e-02   7.9869e-02   5.1079e-02

 Columns 23 through 33:

  -2.5473e-02   1.0308e-01  -5.4506e-02   1.5364e-02   7.9333e-02  -9.5057e-02   8.3467e-03  -9.7799e-02   9.4034e-02   8.5304e-02   1.2128e-01

 Columns 34 through 44:

  -5.8254e-02   3.2460e-02  -1.2287e-01  -4.0331e-02   1.6414e-02   3.7992e-02   2.0596e-02  -3.3507e-02  -1.1631e-01   3.4799e-02  -6.4701e-02

 Columns 45 through 50:

   1.0135e-01   4.7525e-02   3.4787e-02   6.8885e-02  -1.0050e-01   2.0215e-02

>>
```

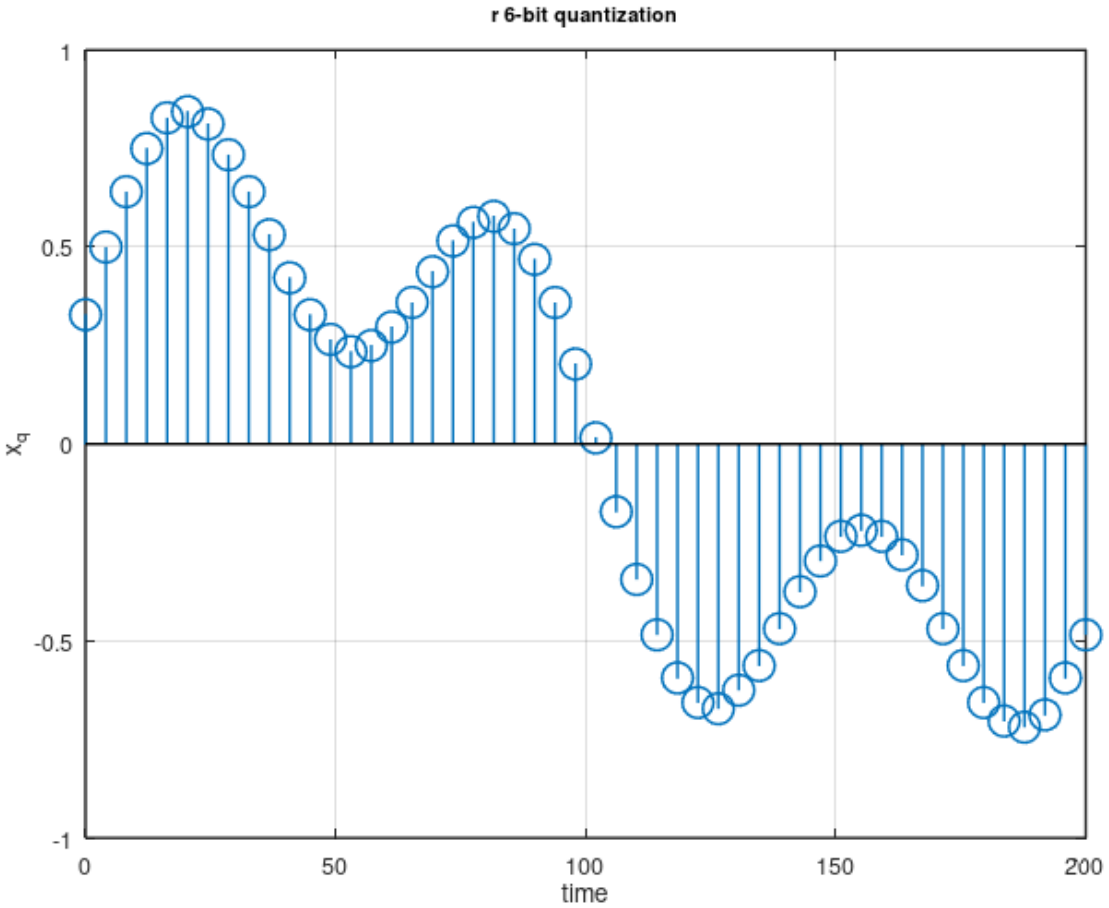
Question 01.d:

Answer:

Octave code:

```
48
49  %r 6-bit quantization
50  f = 50;
51  t = linspace(0, 200 , f);
52  x_t = 1/3*[sin(t/11)+sin(t/31)+cos(t/67)];
53  x_q = round(x_t * 2^6)/2^6; %6bits
54  q_error = (x_t-x_q);
55  stem(t, x_q);
56  xlabel('time');
57  ylabel('x_q');
58  title('r 6-bit quantization');
59  grid on
60
61
```

Figures



Question 01.e:

Answer:

Octave code:

```
34
35  f = 50;
36  t = linspace(0, 200 , f);
37  x_t = 1/3*[sin(t/11)+sin(t/31)+cos(t/67)];
38  x_q = round(x_t * 2^2)/2^2; %2bits --> 2 levels
39
40  %r 6-bit quantization
41  x_q6 = round(x_t * 2^6)/2^6; %6bits
42  figure;
43  subplot(3,1,1);
44  stem(t,x_q);
45  xlabel ('time');
46  ylabel('2 bit quantized signal');
47  title('comparison of 2 quantized signals');
48
49
50  subplot(3,1,2);
51  stem(t,x_q6);
52  xlabel ('time');
53  ylabel('6 bit quantized signal');
54
55
```

Figures