Main script (Question-1)

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Basic Variables

```
L=16; % L = Quantization levels
td=0.01; % td = jump in time
T=0:td:3; % Time axis
x=(5.*(sin(T)).^2) +(4.*cos(T)); % x(t) Function
```

Sampling

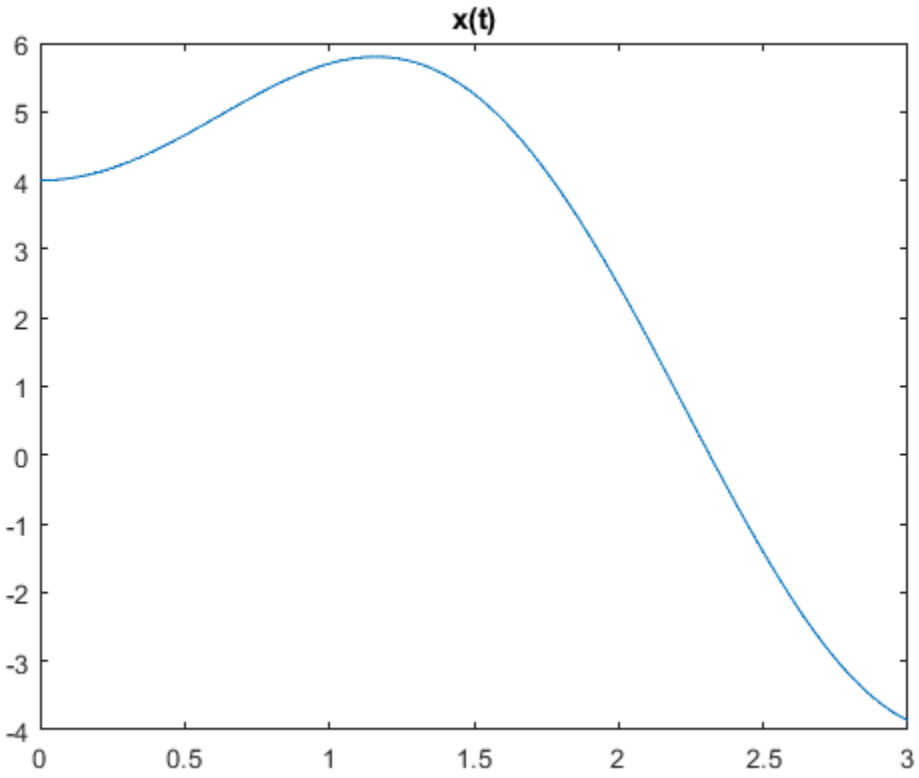
```
Ts=0.05;
% Niquest Rate of Sampling is 2/pi
% So I choose fs = 20Hz or ts=0.05
x_samp=T;
for i=1:length(T)
    if mod((i-1),Ts/td)==0
        x_samp(i)=x(i); % Data is been stored at Sampled Point in Output
    else
        x_samp(i)=x_samp(i-1); % Retaining The Output
    end
end
```

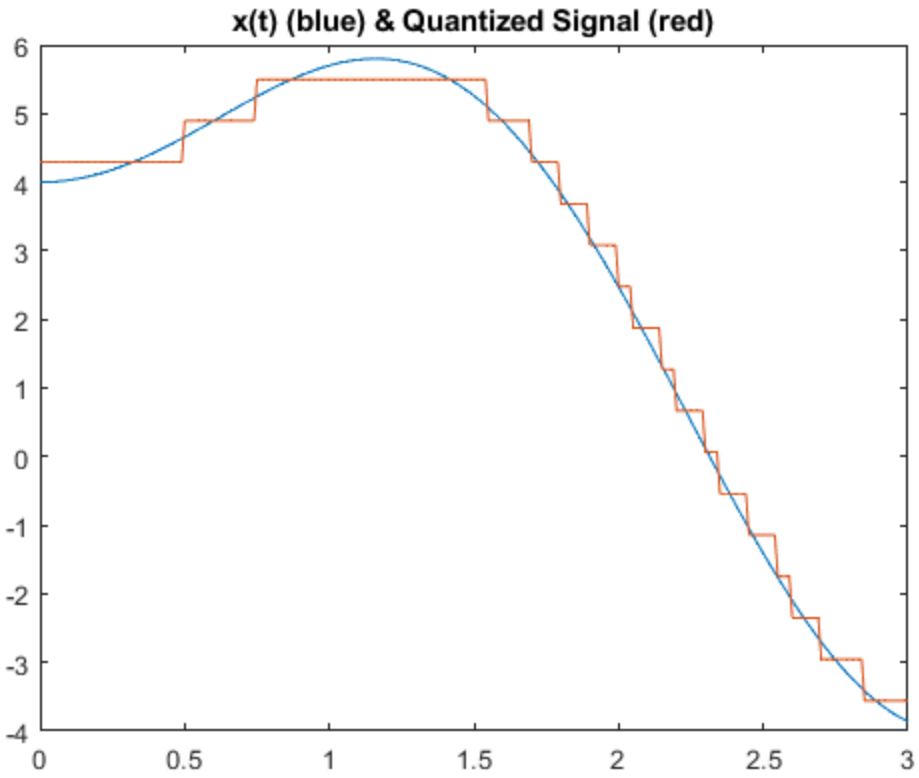
Quantization Logic

```
x_sampmax=max(x_samp);
x_sampmin=min(x_samp);

Quant_interval=(x_sampmax-x_sampmin)/L;
% This is Quantization  Interval or Delta

qs=min(round((1/2)+((x_samp-x_sampmin)/Quant_interval)),L);
% Calculation of Quantization level at the sampled points of x(t)

x_quantized=(x_sampmin)+ (qs-0.5)*(Quant_interval);
% This is the Quantized Signal
```

Ploting of Results

```
figure('Name',"plot-1");
plot(T,x);
title("x(t)");
figure('Name',"plot-2")
plot(T,x);
hold on;
plot(T,x_quantized);
hold off;
title("x(t) (blue) & Quantized Signal (red)");
```





Output of the Quantizer as A Matrix

```
display(x_quantized);
```

```
x_quantized =

  Columns 1 through 7

    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

  Columns 8 through 14

    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

  Columns 15 through 21

    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

  Columns 22 through 28

    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

  Columns 29 through 35

    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903
```

```
Columns 36 through 42

  4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

Columns 43 through 49

  4.2903    4.2903    4.2903    4.2903    4.2903    4.2903    4.2903

Columns 50 through 56

  4.2903    4.8940    4.8940    4.8940    4.8940    4.8940    4.8940

Columns 57 through 63

  4.8940    4.8940    4.8940    4.8940    4.8940    4.8940    4.8940

Columns 64 through 70

  4.8940    4.8940    4.8940    4.8940    4.8940    4.8940    4.8940

Columns 71 through 77

  4.8940    4.8940    4.8940    4.8940    4.8940    5.4978    5.4978

Columns 78 through 84

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 85 through 91

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 92 through 98

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 99 through 105

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 106 through 112

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 113 through 119

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 120 through 126

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 127 through 133
```

```
  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 134 through 140

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 141 through 147

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 148 through 154

  5.4978    5.4978    5.4978    5.4978    5.4978    5.4978    5.4978

Columns 155 through 161

  5.4978    4.8940    4.8940    4.8940    4.8940    4.8940    4.8940

Columns 162 through 168

  4.8940    4.8940    4.8940    4.8940    4.8940    4.8940    4.8940

Columns 169 through 175

  4.8940    4.8940    4.2903    4.2903    4.2903    4.2903    4.2903

Columns 176 through 182

  4.2903    4.2903    4.2903    4.2903    4.2903    3.6865    3.6865

Columns 183 through 189

  3.6865    3.6865    3.6865    3.6865    3.6865    3.6865    3.6865

Columns 190 through 196

  3.6865    3.0828    3.0828    3.0828    3.0828    3.0828    3.0828

Columns 197 through 203

  3.0828    3.0828    3.0828    3.0828    2.4790    2.4790    2.4790

Columns 204 through 210

  2.4790    2.4790    1.8753    1.8753    1.8753    1.8753    1.8753

Columns 211 through 217

  1.8753    1.8753    1.8753    1.8753    1.8753    1.2715    1.2715

Columns 218 through 224

  1.2715    1.2715    1.2715    0.6677    0.6677    0.6677    0.6677
```

```
  Columns 225 through 231

    0.6677    0.6677    0.6677    0.6677    0.6677    0.6677    0.0640

  Columns 232 through 238

    0.0640    0.0640    0.0640    0.0640   -0.5398   -0.5398   -0.5398

  Columns 239 through 245

   -0.5398   -0.5398   -0.5398   -0.5398   -0.5398   -0.5398   -0.5398

  Columns 246 through 252

   -1.1435   -1.1435   -1.1435   -1.1435   -1.1435   -1.1435   -1.1435

  Columns 253 through 259

   -1.1435   -1.1435   -1.1435   -1.7473   -1.7473   -1.7473   -1.7473

  Columns 260 through 266

   -1.7473   -2.3510   -2.3510   -2.3510   -2.3510   -2.3510   -2.3510

  Columns 267 through 273

   -2.3510   -2.3510   -2.3510   -2.3510   -2.9548   -2.9548   -2.9548

  Columns 274 through 280

   -2.9548   -2.9548   -2.9548   -2.9548   -2.9548   -2.9548   -2.9548

  Columns 281 through 287

   -2.9548   -2.9548   -2.9548   -2.9548   -2.9548   -3.5585   -3.5585

  Columns 288 through 294

   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585

  Columns 295 through 301

   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585   -3.5585
```

Dimension Of The Matrix

```
display(size(x_quantized));

     1   301
```

End of the Code

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