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```
close all;
clear;
clc;
```

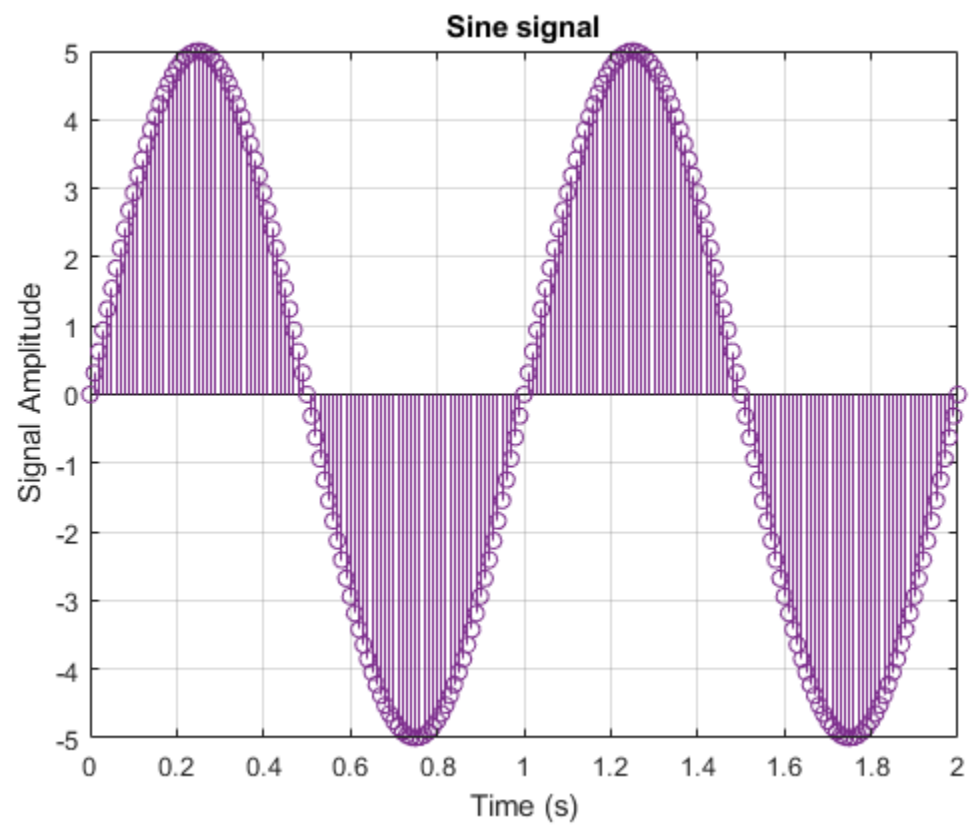
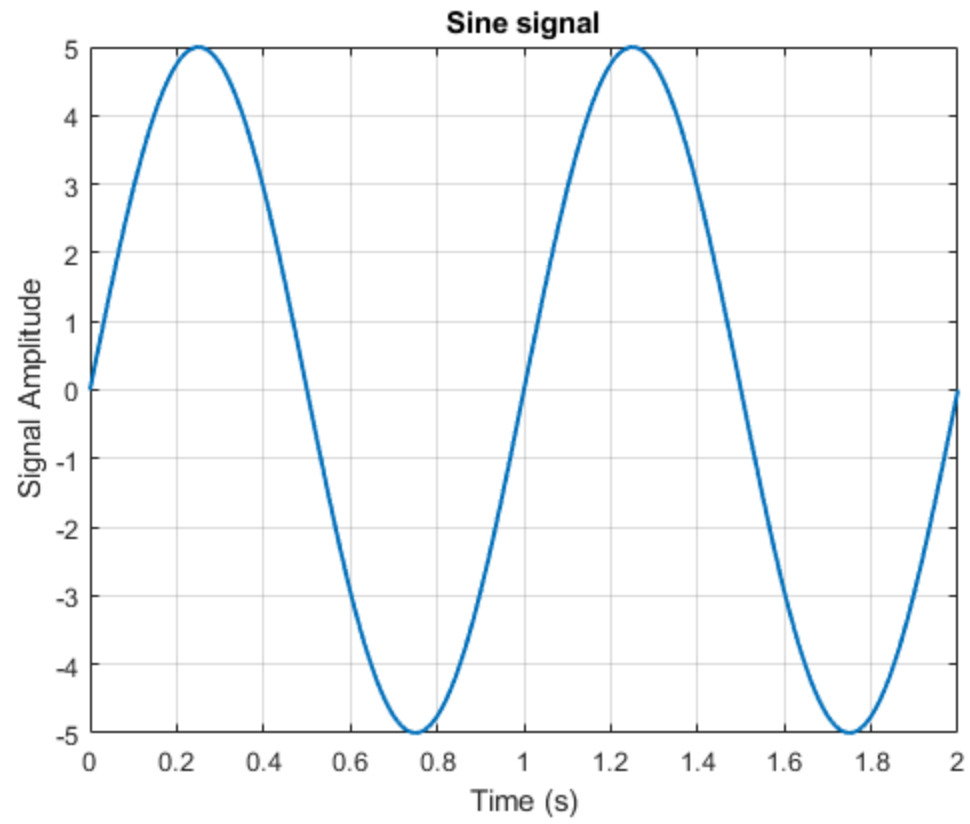
part 1

part 1.1

```
t = 0:0.01:2;          % Define time axis
A = 5;                 % Amplitude
f = 1;                 % Frequency
y = A*sin(2*pi*f*t); % Sine function

% Plotting signals
figure('Name', 'Sine signal (Plot)');
plot(t, y, 'LineWidth', 1.5);
xlabel('Time (s)');
ylabel('Signal Amplitude');
title('Sine signal');
grid on;

figure('Name', 'Sine signal (Stem)');
stem(t, y, 'color', '#7E2F8E', 'LineWidth', 0.5);
xlabel('Time (s)');
ylabel('Signal Amplitude');
title('Sine signal');
grid on;
```

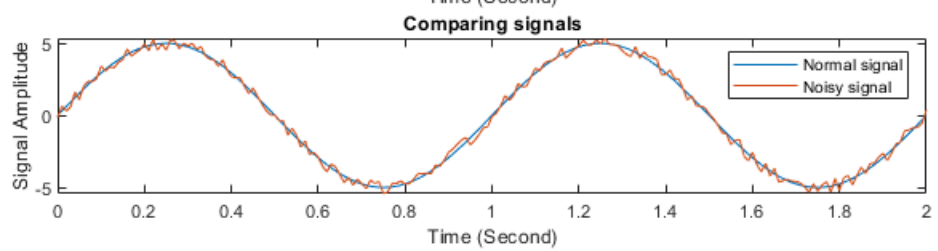
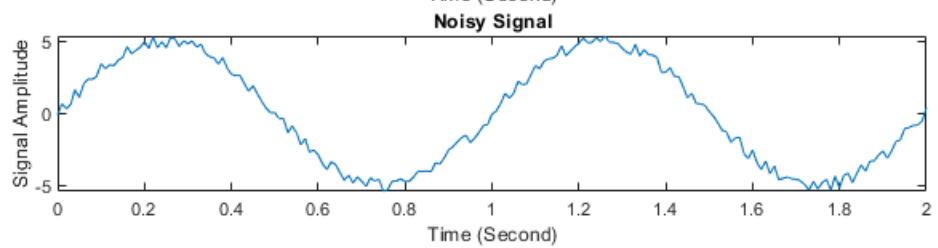
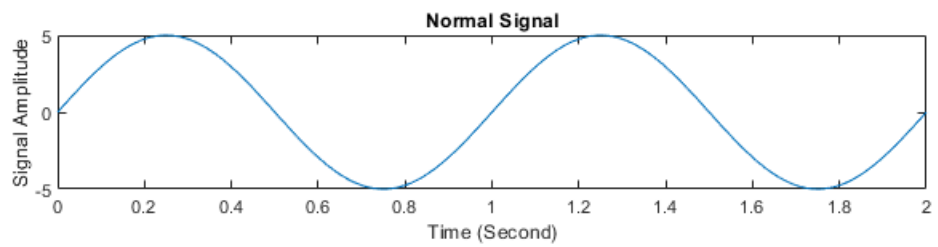
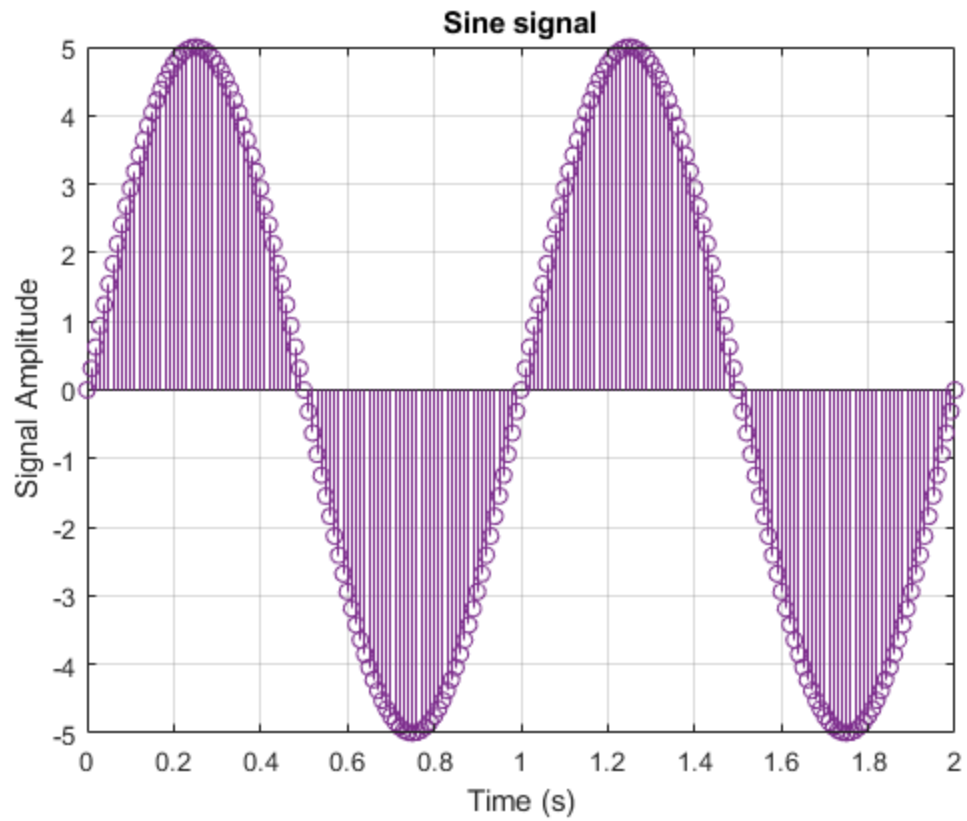


part 2

part 1.2

```
r = rand(1, length(y)) - 0.5; % Noise
noised_signal = y + r;         % Add noise to sine, y defined in
    section 1.1

% Plotting signals
figure('Name', 'Normal Sine signal VS Noisy Sine Signal', 'Position',
    [300 200 700 500]);
subplot(3,1,1);                % Plotting normal signal without noise
plot(t,y)
title('Normal Signal');xlabel('Time (Second)');ylabel('Signal
    Amplitude');
subplot(3,1,2);                % Plotting noisy signal
plot(t,noised_signal)
title('Noisy Signal');xlabel('Time (Second)');ylabel('Signal
    Amplitude');
%hold on;
subplot(3,1,3);                % Plotting both signal together for
    comparing them
plot(t,y, t, noised_signal)
hold on;
title('Comparing signals');xlabel('Time (Second)');ylabel('Signal
    Amplitude');
legend('Normal signal', 'Noisy signal');
hold off;
```



part 3

part 1.3:

```
M1 = 0;
M2 = 20;
len = M2 + M1 + 1; % Window length

window = ones(1, len) / len; % Moving average window

y2 = conv(noised_signal, window); % Noised signal defined in section
    1.2, Line 30
t2 = 0:0.01:(0.01 * (length(y2) - 1));

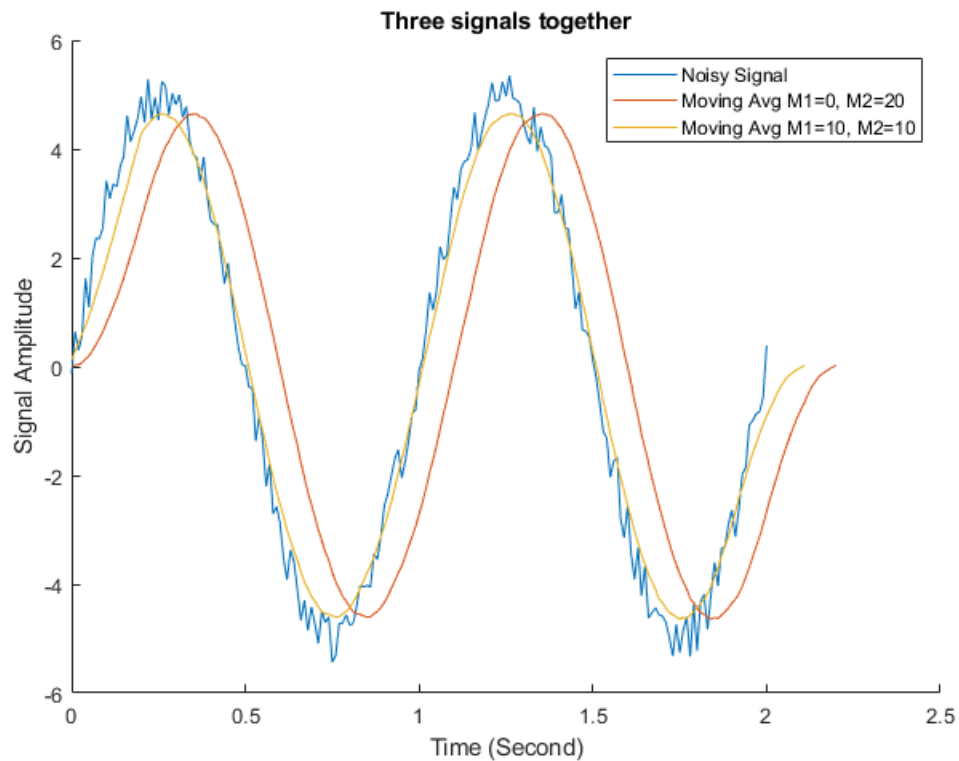
% Plotting section 1.3.1
figure('Name', 'Moving Avg signals', 'Position', [300 200 700 500]);
hold on;
plot(t, noised_signal); % Noise signal
plot(t2, y2); % Moving Avg M1=0, M2=20

% part 1.3.2:
M1 = 10;
M2 = 10;
len = M2 + M1 + 1; % Window length

window = ones(1, len) / len; % Moving average window

y3 = conv(noised_signal(M1:end), window);
t3 = 0:0.01:(0.01 * (length(y3) - 1));

plot(t3, y3); % Moving Avg M1=0, M2=20
hold off;
title('Three signals together'); xlabel('Time (Second)');
ylabel('Signal Amplitude');
legend('Noisy Signal', 'Moving Avg M1=0, M2=20', 'Moving Avg M1=10,
    M2=10');
```



part 4

part 1.4.1

```
M1 = 0;
M2 = 20;
len = M2 + M1 + 1; % Window length

b = ones(1,len)/len;
a = 1;
y4_1 = filter(b, a, noised_signal);
t4_1 = 0:0.01:(0.01 * (length(y4_1) - 1));

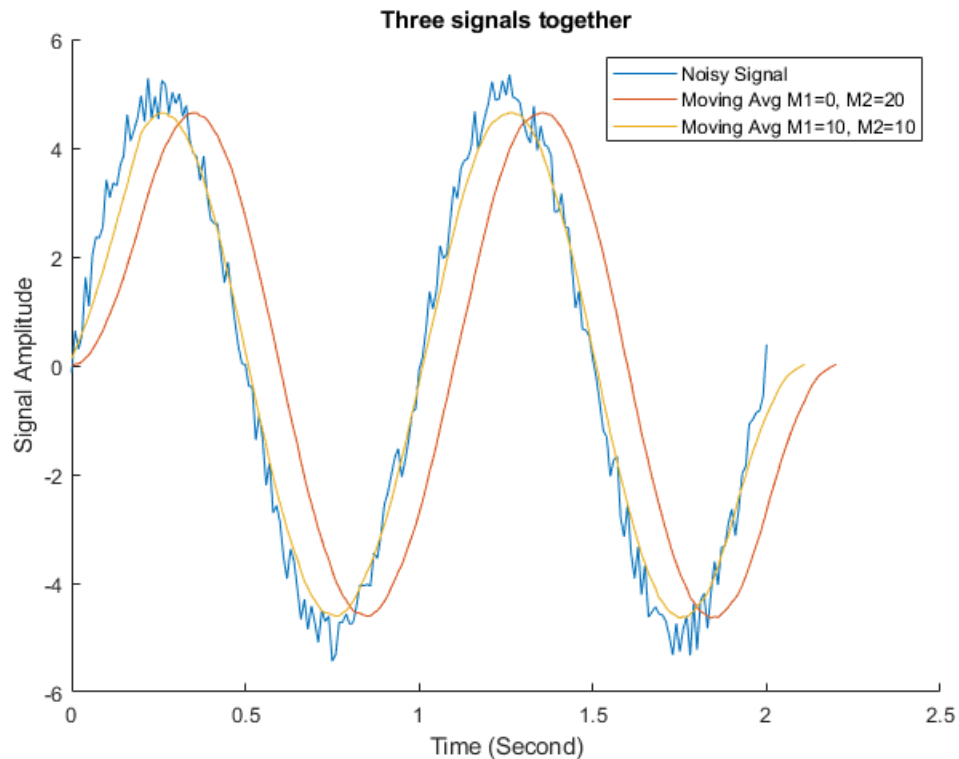
% Plotting section 1.4
figure('Name', 'Moving Avg signals by using filter
function', 'Position', [300 200 700 500]);
hold on;
plot(t,noised_signal);           % Noise signal
plot(t4_1, y4_1);               % filtered signal
plot(t2,y2);                    % Plotting convolved signal M1=0,
                                M2=20
plot(t3,y3);                    % Plotting convolved signal M1=10,
                                M2=10
title('All signals together'); xlabel('Time (Second)'); ylabel('Signal
Amplitude');
legend("Noisy Signal", "filtered signal", "Moving Avg M1=0,
M2=20", "Moving Avg M1=10, M2=10");
```

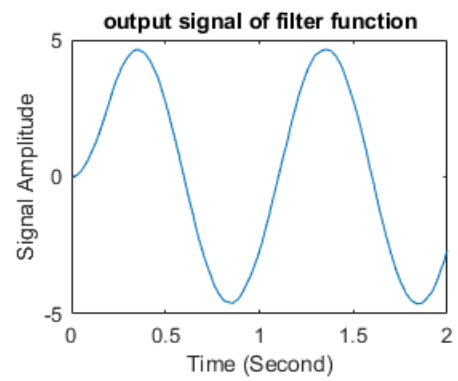
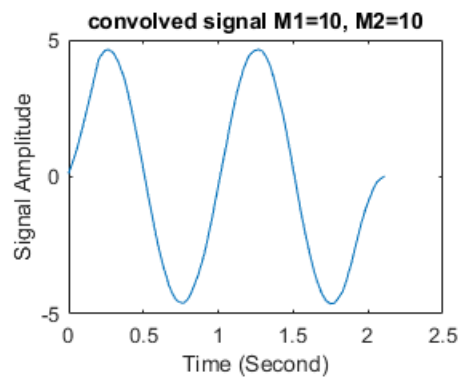
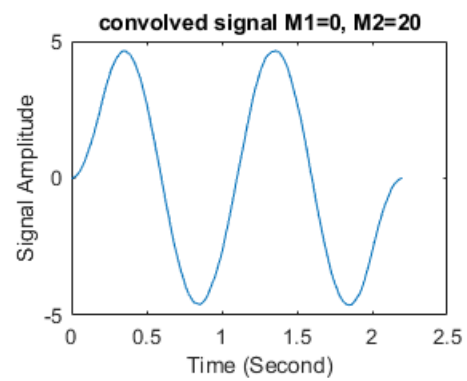
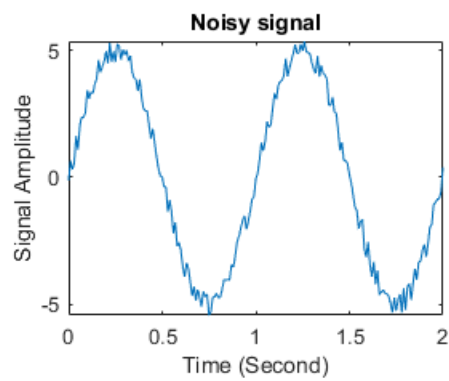
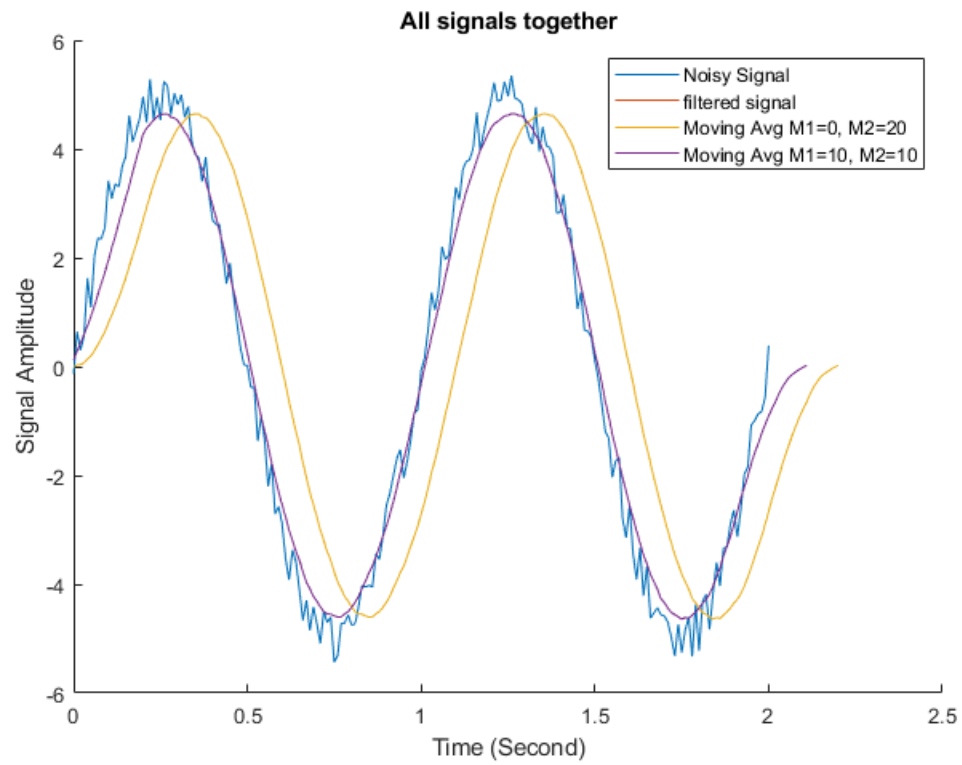
```

hold off;

% Plotting section 1.3
figure('Name', 'plotting in seperated subplots', 'Position', [300 200
    700 500]);
subplot(2,2,1);                % Plotting noisy signal
plot(t,noised_signal)
title('Noisy signal');xlabel('Time (Second)');ylabel('Signal
    Amplitude');
subplot(2,2,2);                % Plotting convolved signal M1=0, M2=20
plot(t2,y2)
title('convolved signal M1=0, M2=20');xlabel('Time
    (Second)');ylabel('Signal Amplitude');
subplot(2,2,3);                % Plotting convolved signal M1=10, M2=10
plot(t3,y3)
title('convolved signal M1=10, M2=10');xlabel('Time
    (Second)');ylabel('Signal Amplitude');
subplot(2,2,4);                % filtered signal
plot(t4_1,y4_1)
title('output signal of filter function');xlabel('Time
    (Second)');ylabel('Signal Amplitude');

```

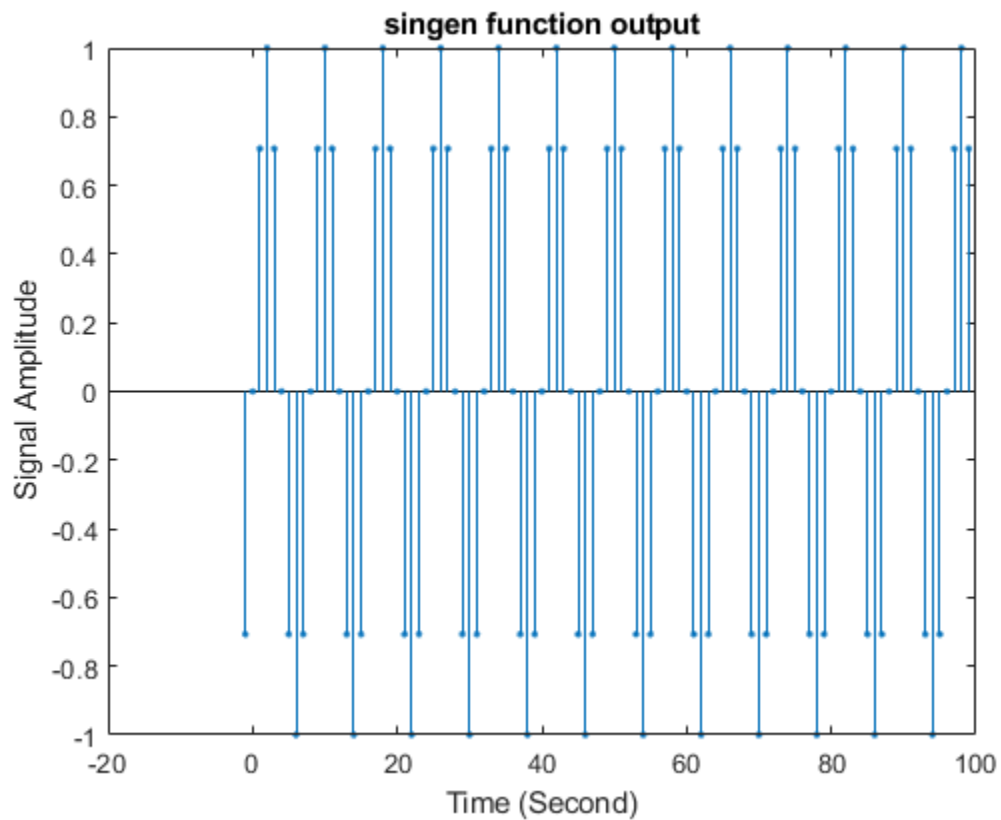




part 5

part 1.5

```
w0 = pi/4; n = 101;  
[y5,t5] = singen(w0,n); %singen function is defined in singen.m  
figure('Name', 'singen');  
stem(t5,y5, '.')  
title('singen function output');xlabel('Time (Second)');ylabel('Signal  
Amplitude');
```



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