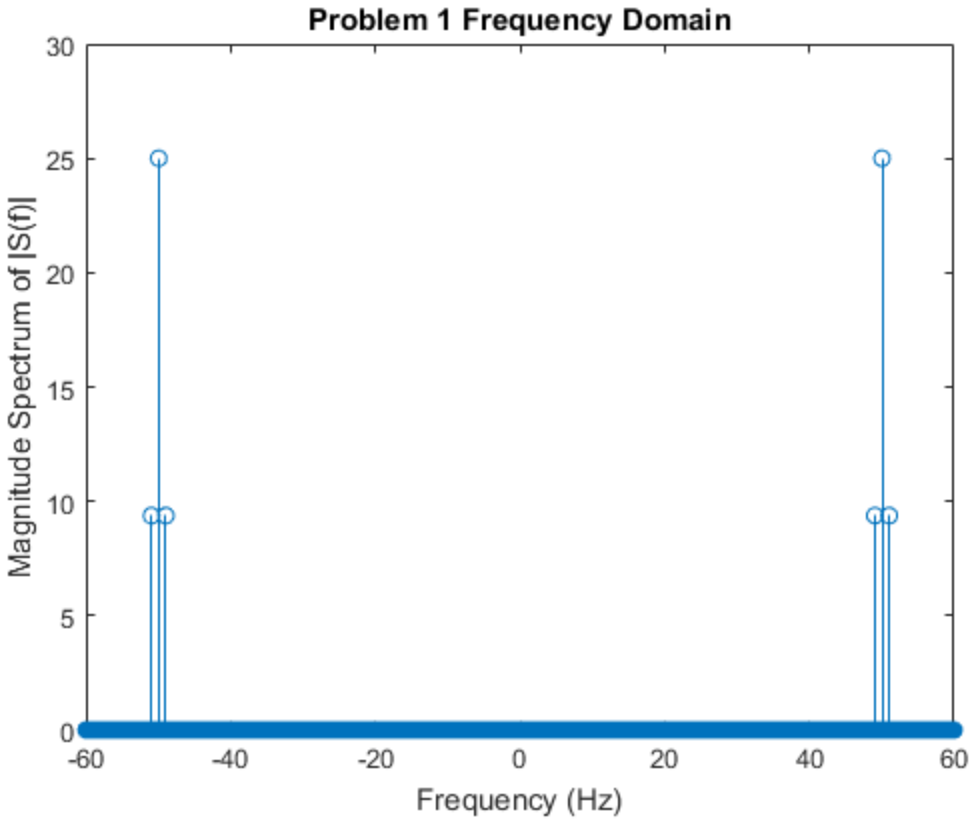
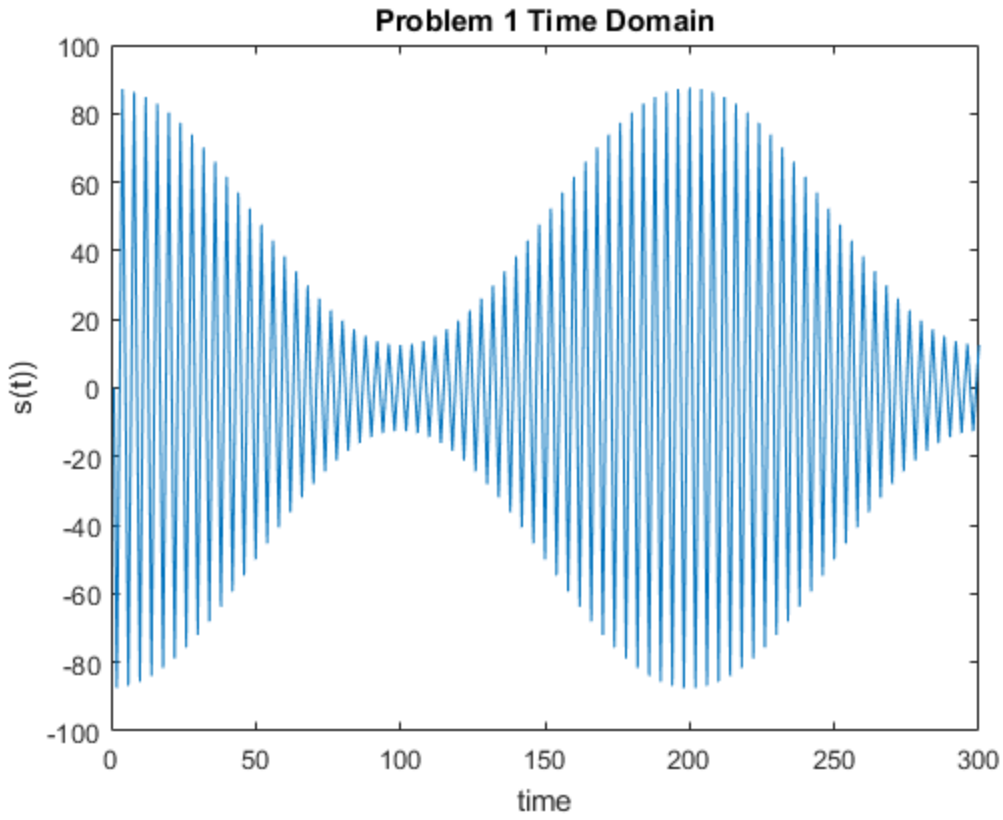
```
% Joseph Palicke
% Project 1
% Problem 1

n    = -1999:2000;             % Establishing 1000 points
Ts   = 0.005;                  % Sample period
t    = n * Ts;                 % Time scaling
ka   = 0.0375;                 % Amplitude sensitivity
fm   = 1;                      % Message frequency
Am   = 20;                     % Message amplitude
m    = Am*cos(2*pi*fm*t);      % Message with unit frequency
fc   = 50;                     % Carrier Frequency 10 Hz
Ac   = 50;                     % Carrier Amplitude
s = Ac.*(1+ka.*Am.*cos(2.*pi.*fm.*t)).*cos(2.*pi.*fc.*t); % FM
 waveform
delf = 1/(Ts*4000);           % Separation of frequencies
f    = n*delf;                 % Frequency scaling
sft  = abs(fft(s))/4000;       % Spectrum magnitude
stem(f,fftshift(sft));
axis([-60,60,0,30]);
xlabel('Frequency (Hz)')
ylabel('Magnitude Spectrum of |S(f)|')
title('Problem 1 Frequency Domain')

figure(2);
plot(s);
axis([0,300,-100,100]);
xlabel('time')
ylabel('s(t))')
title('Problem 1 Time Domain')

Pav100ohm = (Ac^2)/200 + ((Ac^2)*((ka*Am)^2))/400

mu = ka * Am;

PowerRatioSidebandstoTotal = mu^2/(2+mu^2)

DSB_SCPercentImprovement = (Am/mu)^2 - 1


Pav100ohm =

   16.0156


PowerRatioSidebandstoTotal =

    0.2195


DSB_SCPercentImprovement =
```

```
710.1111
```


Problem 1 Frequency Domain
Magnitude Spectrum of |S(f)|
Frequency (Hz)
30
25
20
15
10
5
0
-60
-40
-20
0
20
40
60



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