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DSP ML2 Assignment

1.

a) The fundamental frequency is 25 Hz. This was found by finding the greatest common denominator of all the frequencies.
b) We know that the given signal is periodic because all the frequencies are related by a rational ratio (the fundamental frequency is a real number).
c) function spplot(spec)

```
% SPPLOT plots the two-sided magnitude and phase spectrum
% usage: spplot(spec)
% input: spec - a structure with
%        spec.f - a vector of non-negative frequencies only
%        spec.X - the complex coefficients of the spectrum
% output: a figure with two subplots with the spectrum plots
if nargin == 0
  help spplot
  Return
End
subplot(211)
  p=stem(spec.f,abs(spec.X));
  set(p,'Marker','none')
  set(p,'LineWidth',6)
  ylabel('abs(X)')
  xlabel('f [Hz]')
  Grid
subplot(212)
  q=stem(spec.f,angle(spec.X)/pi);
  set(q,'Marker','none')
  set(q,'LineWidth',6)
  ylabel('arg(X)\/pi')
  xlabel('f [Hz]')
  grid
```

d) When the function is called without arguments, it calls “help” on the function and shows information on the function.

2.

a) >> fo=25;

```
>> fmax = spec.f(end);
>> h = 1/(40*fmax);
>> t0=0;tf=3*1/fo;
>> t = t0:h:tf;
>> N = length(spec.f);
>> pos = ceil(N/2);
>> x = zeros(size(t));
>> if rem(pos,N)
DC = spec.X(pos);
x = x + DC;
End
>> for k = pos+1:N
x = x + (spec.X(k)*exp( j*2*pi*spec.f(k)*t) + conj(spec.X(k))*exp(-j*2*pi*spec.f(k)*t));
End
>> plot(t,x);
>> hold on
>> plot(t,DC,'r')
>> xlabel('t [sec]')
>> ylabel('x(t)')
>> grid
>> hold off
```