```
%
```

Matlab Coursework 1. Student number: 1759846

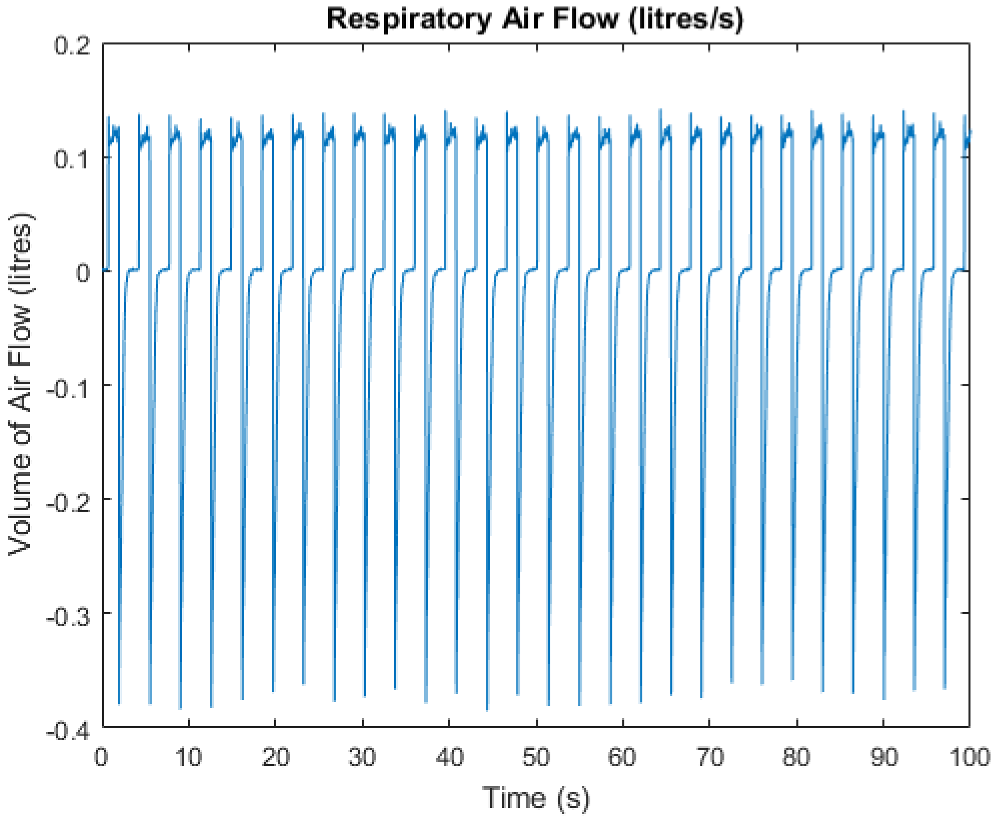
```
clear all;
load resp_pig.mat;
```

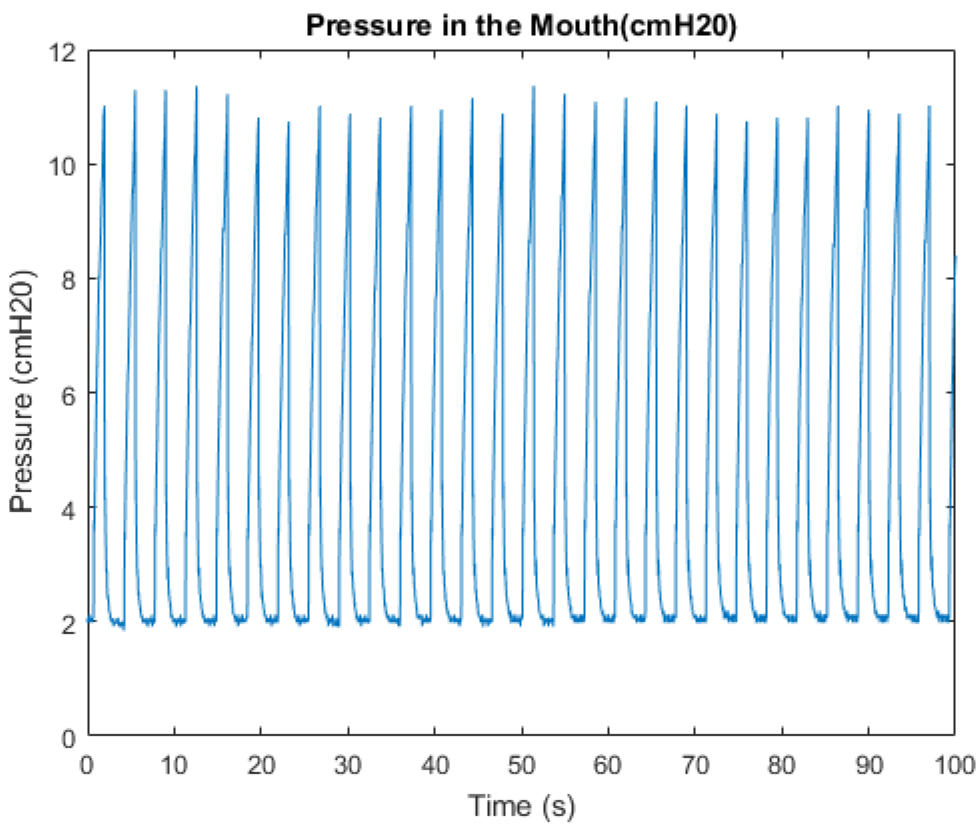
%1.(a) The sampling frequency is given as 200, therefore we know that the %sampling period will be the inverse of this.

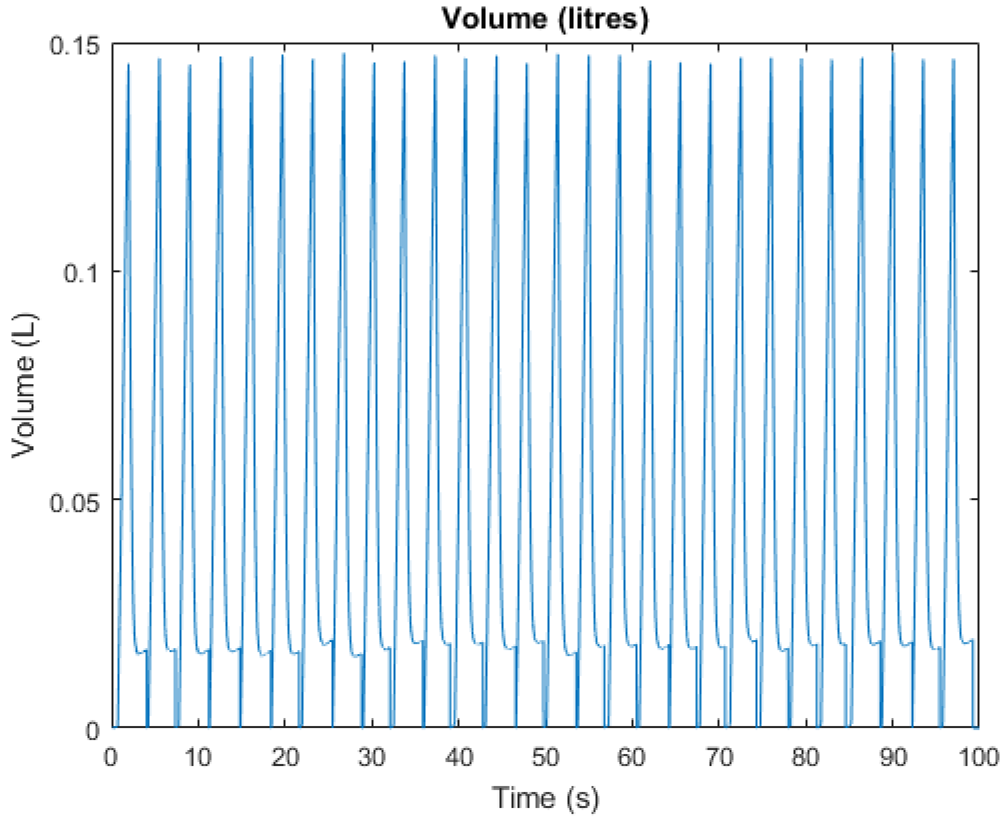
```
SP=1/fs;
```

%1.(b) Plotting all of the signals

```
N=20001;
T=(0:N-1)*SP;%Here I am creating an array of time so that I can plot
 the signals against time
figure;
plot(T,flw);
title('Respiratory Air Flow (litres/s)')
xlabel('Time (s)')
ylabel('Volume of Air Flow (litres)')
figure;
plot(T,mouth_pressure);
title('Pressure in the Mouth(cmH20)')
xlabel('Time (s)')
ylabel('Pressure (cmH20)')
figure;
plot(T,volume);
title('Volume (litres)')
xlabel('Time (s)')
ylabel('Volume (L)')
```


Respiratory Air Flow (litres/s)
Volume of Air Flow (litres)
Time (s)
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
0
10
20
30
40
50
60
70
80
90
100


Pressure in the Mouth(cmH20)
Pressure (cmH20)
Time (s)
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100



%1.(c)Respiratory frequency in cycles/minute and volume of inspired air per %respiratory cycle

```
%By looking at the volume graph, we can see that there are 17 cycles
 in 60
%seconds
cyclesPerMin=17;
%The volume of air inspired per cycle is 0.145L
volInspiredAirPerCycle=0.145;
```

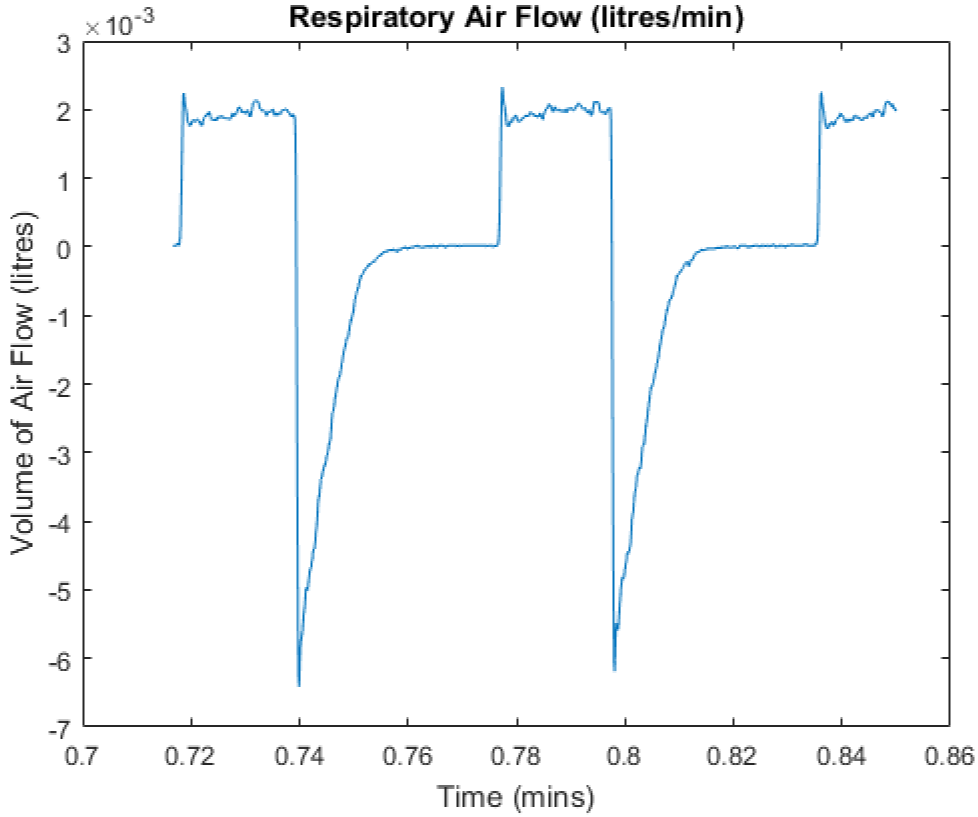
%1.(d) Convert flow signal from litres/s to litres/min

```
flwPerMin=flw/60;
```

%1.(e) Plot resultant signal from 43 to 51 seconds

```
Tmins=T/60;
%I want to find 43 and 51 seconds in units of minutes
a=43/60;
b=51/60;
%now i am looking for the indicies of these crossing points
A=find(Tmins>a);
B=find(Tmins>b);
%The first index in A was 8602, and the last in B was 10202 so to
%include the full range from 43s-51s I chose to plot the range from
 Tmins(8601:10202)
figure;
plot(Tmins(8601:10202),flwPerMin(8601:10202));
```

```
title('Respiratory Air Flow (litres/min)')
xlabel('Time (mins)')
ylabel('Volume of Air Flow (litres)')
```

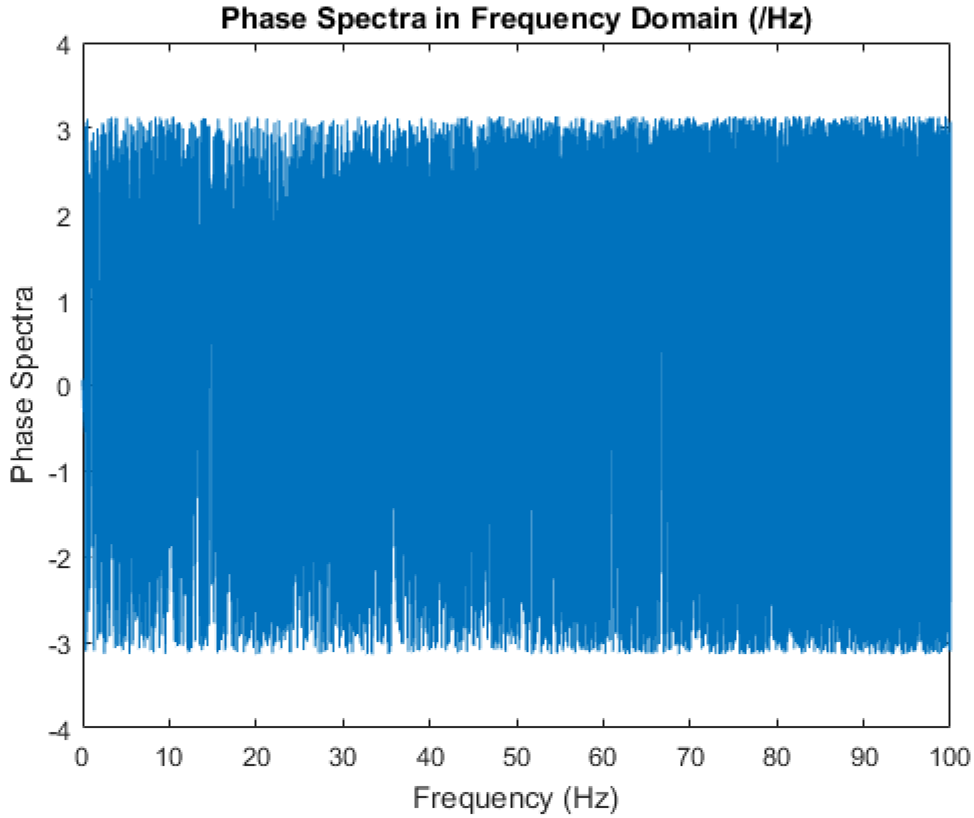


%1.(f)Calculate the amplitude and phase spectra of the respiratory air flow signal.

```
[amplitude,phase,frequency]=a_p_dft(flw,fs,N);
%I calculated the amplitude and phase spectra using the fast fourier
%transform
```

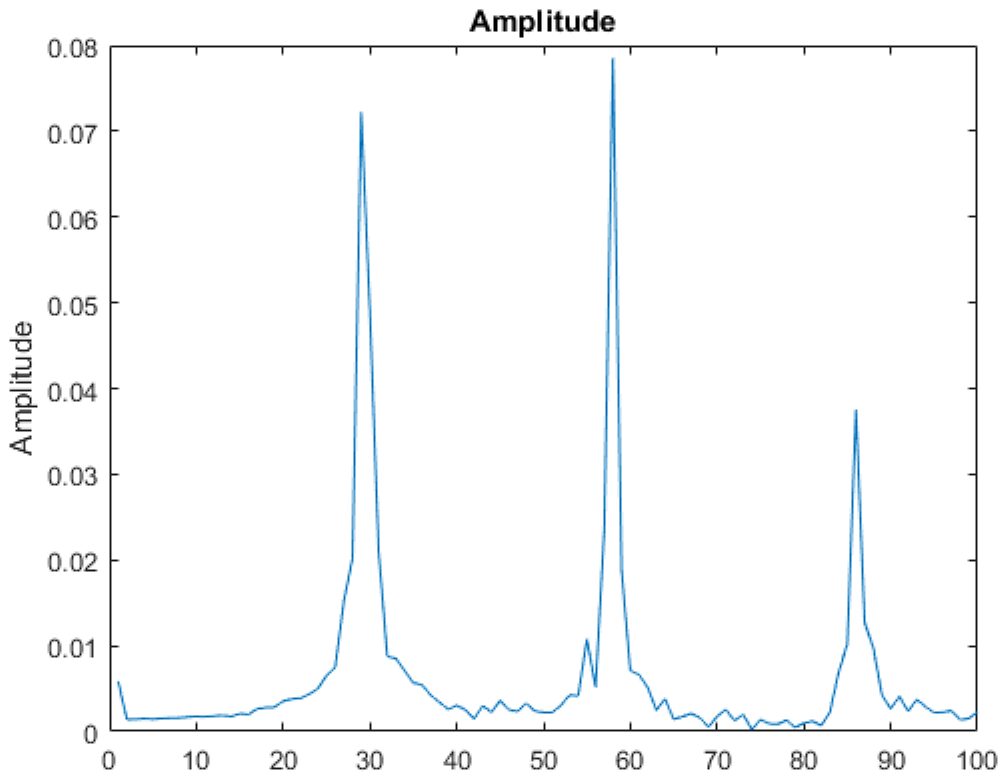
%1.(g) Plot the spectra signal in the frequency domain.

```
figure;
plot(frequency,phase);
title('Phase Spectra in Frequency Domain (/Hz)')
xlabel('Frequency (Hz)')
ylabel('Phase Spectra')
```



%1.(h)By considering the respiratory frequency (see items b and c above) check that the %first three peaks in the amplitude spectrum correspond to the first three harmoncis of %the respiratory frequency

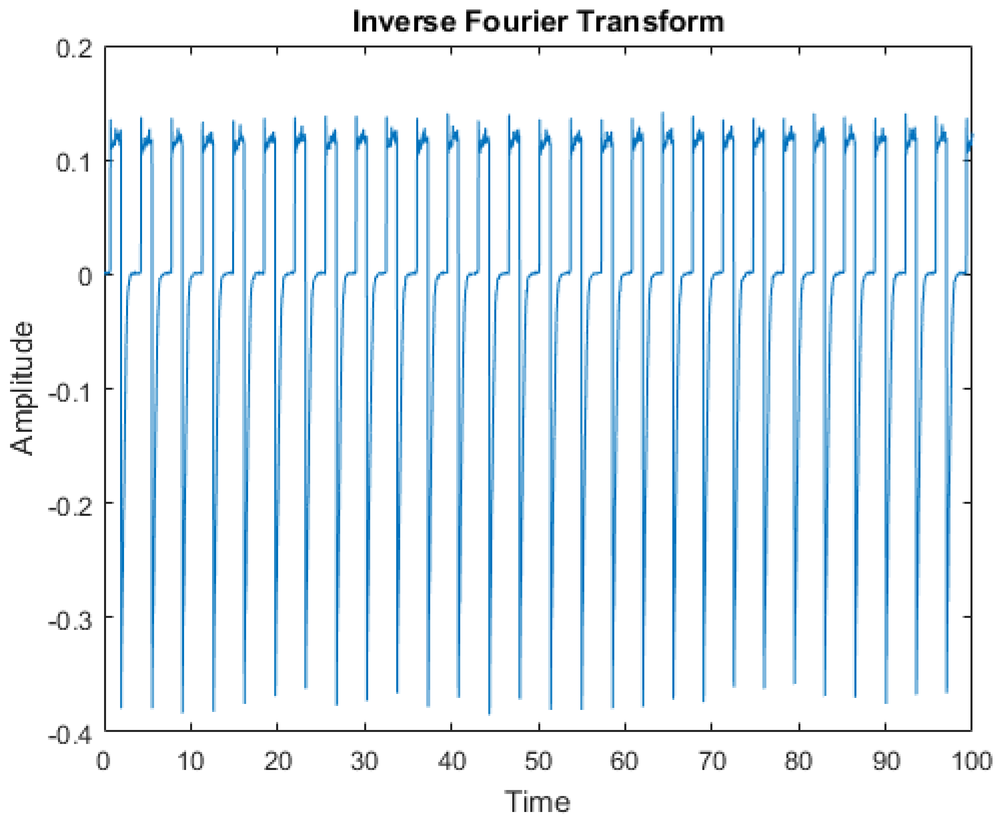
```
figure;
plot(amplitude(1:100));
title('Amplitude')
ylabel('Amplitude')
%The cycle frequency was 17 cycles per minute which is equal to 0.2883
%cycles/s. On the graph showing the amplitude here, we can see that
 the
%first three peaks occur at approximately 0.2833, 0.5666 (2*0.2833),
 and
%0.8499 (3*0.2833), therefore correspondiong to the first three
 harmonics
%of the respiratory frequency.
```



%1.(i)Calculate the inverse Fourier transform, and show that this exactly recovers the %signal

```
[inverseFTransform,t]=i_a_p_dft(amplitude,phase,frequency,fs);
figure;
plot(t,inverseFTransform);
title('Inverse Fourier Transform');
ylabel('Amplitude');
xlabel('Time');

%As you can see, the inverse Fourier Transform graph is exactly the
 same as
%the original respiratory air flow graph.
```



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