Assignment 3
EE 6543 taught at UMSA
Adaptive Signal Processing
Due Date: Tuesday, June 18, 2019
Due Location: in the lecture
Ingeniería Electrónica
Universidad Mayor de San Andrés
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No.	Mark
1	/6
2	/13
Total	/19

Problem 1. _____ mark(s) / 6 mark(s)

Fig. 1 shows the output of two sensors that are on a pregnant woman. The first figure has a signal containing both the mother's and baby's heart rate. The second figure has a signal containing only the mother's heart rate.
The provided online program `ee6543_assignment3_problem1_data.m` loads these plain-text data files

```
assignment3problem1data1
assignment3problem1data2
assignment3problem1data3
assignment3problem1data4
```

and draws figures.

1a. **1 mark(s)**
Estimate the heart-rate of the mother in beats per minute. Show all your work.

1b. **5 mark(s)**
Estimate the heart-rate of the baby in beats per minute. Show all your work.
You might have to develop and entire adaptive signal processing simulation to find the answer; also, the problem is numerically difficult.

Problem 2. _____ mark(s) / 13 mark(s)

The provided online program `ee6543_assignment3_problem2.m` provides a least-mean square (LMS) simulation for an inverse filtering application.

2a. **1 mark(s)**
Run the program for the channel

```
h = [ 1  0    0    0   ] ;
```

and provide the two output plots.

2b. **2 mark(s)**
Run the program for the channel

```
h = [ 0  1    0    0   ] ;
```

and provide the two output plots. What change occurred in equalizer coefficients, $\underline{w}$?

2c. **3 mark(s)**
Run the program for the channel

```
h = [ 1  0.5  0.3  0.2 ] ;
```

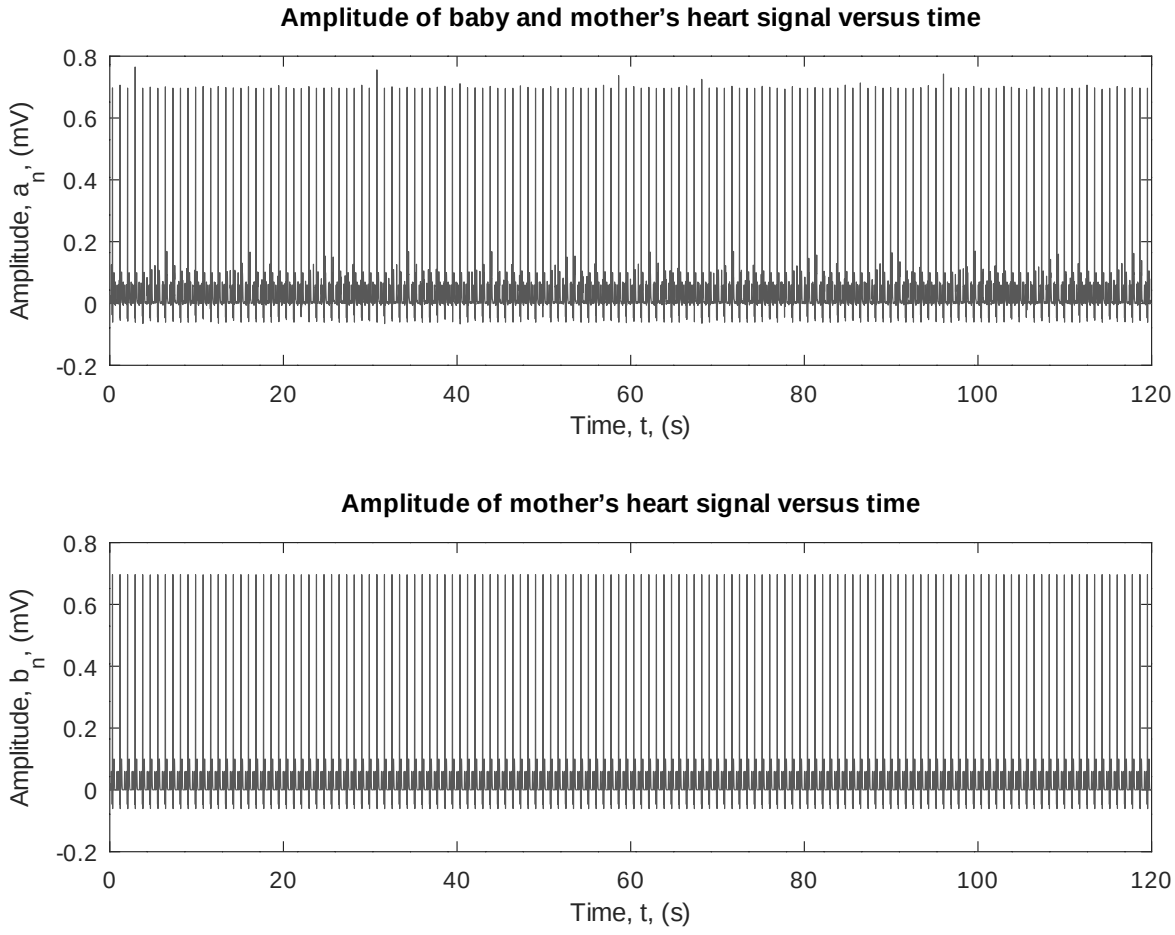

Figure 1: Sensor outputs from a pregnant woman

and provide the two output plots.
After $\underline{w}$ converged, plot the convolution of $\underline{h}$ and $\underline{w}$.
Has the equalizer $\underline{w}$ undone the distortion caused by the channel $\underline{h}$? Answer either yes or no.

2d. **1 mark(s)**

Run the program for the channel

```
h = [ 1  1    0    0   ] ;
```

and provide the two output plots.
After $\underline{w}$ converged, plot the convolution of $\underline{h}$ and $\underline{w}$. The equalizer $\underline{w}$ did not effectively undo the distortion caused by the channel $\underline{h}$.

2e. **3 mark(s)**

In the time-domain, explain why $\underline{w}$ did not effectively undo the distortion caused by $\underline{h}$.

2f. **3 mark(s)**

In the frequency-domain, explain why $\underline{w}$ did not effectively undo the distortion caused by $\underline{h}$.