Question 2

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%Part a) done in MATLAB, parts b) and c) in Python
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Part a) It is done by using dwt2 to decompose it into two frequency components (High and Low) and the same is plotted.

```matlab
clc;
clear all;

FXY_CAMERAMAN = imread('cameraman.jpg');
FXY_LENNA = imread('lenna.jpg');



figure;
imshow(FXY_CAMERAMAN);title("Cameraman Image");

[LF_COMPONENTS_DB,HF_COMPONENTS_DB] = dwt2(FXY_CAMERAMAN,'db2','mode','sym');
[LF_COMPONENTS_HAAR,HF_COMPONENTS_HAAR] = dwt2(FXY_CAMERAMAN,'haar','mode','sym');


figure;
subplot(2,2,1);
imshow(uint8(LF_COMPONENTS_HAAR));title("Low Freq Coefficients HAAR - Cameraman")
subplot(2,2,2);
imshow(HF_COMPONENTS_HAAR);title("High Freq Coefficients HAAR - Cameraman")
subplot(2,2,3);
imshow(uint8(LF_COMPONENTS_DB));title("Low Freq Coefficients DB - Cameraman")
subplot(2,2,4);
imshow(HF_COMPONENTS_DB);title("High Freq Coefficients DB - Cameraman")




figure;
imshow(FXY_LENNA);title("Lenna Image");

[LF_COMPONENTS_DB,HF_COMPONENTS_DB] = dwt2(FXY_LENNA,'db2','mode','sym');
[LF_COMPONENTS_HAAR,HF_COMPONENTS_HAAR] = dwt2(FXY_LENNA,'haar','mode','sym');



figure;
subplot(2,2,1);
imshow(uint8(LF_COMPONENTS_HAAR)); title("Low Freq Coefficients HAAR  - Lenna")
subplot(2,2,2);
imshow(HF_COMPONENTS_HAAR);title("High Freq Coefficients HAAR - Lenna")

subplot(2,2,3);
imshow(uint8(LF_COMPONENTS_DB)); title("Low Freq Coefficients DB - Lenna")
```

```
subplot(2,2,4);
imshow(HF_COMPONENTS_DB);title("High Freq Coefficients DB -Lenna")
```
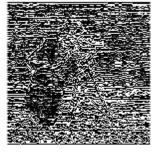
Cameraman Image

Low Freq Coefficients HAAR - Cameraman **High Freq Coefficients HAAR - Cameraman**

Low Freq Coefficients DB - Cameraman **High Freq Coefficients DB - Cameraman**

Lenna Image

Low Freq Coefficients HAAR - Lenna

High Freq Coefficients HAAR - Lenna

Low Freq Coefficients DB - Lenna

High Freq Coefficients DB -Lenna

Observation in Part a):

- **The low frequency components contains an approximate image to the original image. The approximate image is somewhat blurred.**

- **The High Frequency components contain edge information**

- **The low frequency components in each image is almost same for HAAR as well as DB**

- **The high frequency components in each image is different when HAAR is used vs DB**

- **Using Haar (High Frequency), the edges are visible and it is apparent to naked eye that edges are present. While as using DB, the High frequency components dont show edges so clearly**

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