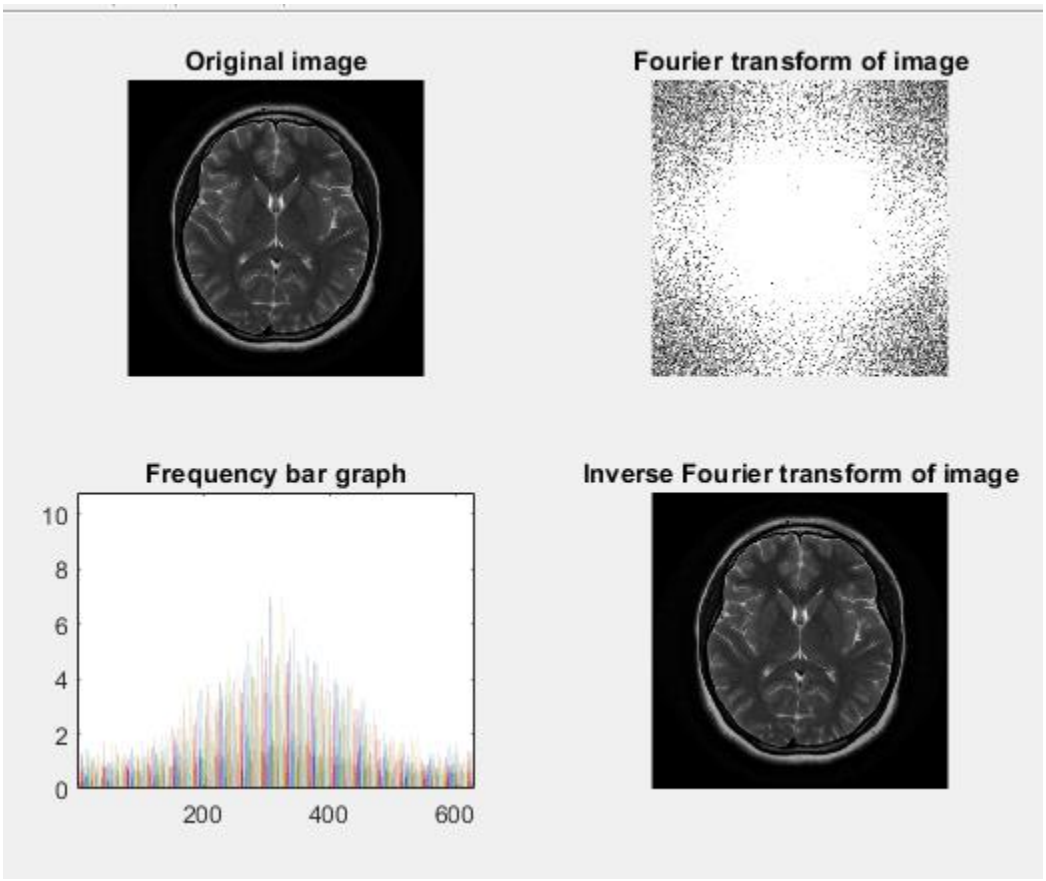
Question 1

Apply Fourier transform to transform an image from spatial domain to frequency domain. Apply inverse Fourier transform to transform the image from frequency domain to spatial domain.

Code:

```
img = imread('MRI.png');
img2 = double(mat2gray(img));
F = fftshift(fft2(img2));
I = log(1+abs(F));
imginv=abs(ifft2(F));
subplot(2,2,1);imshow(img); title('Original image');
subplot(2,2,2);imshow(I); title('Fourier transform of image');
subplot(2,2,3);bar(I); title('Frequency bar graph');
subplot(2,2,4);imshow(imginv); title('Inverse Fourier transform of image');
```

Output:



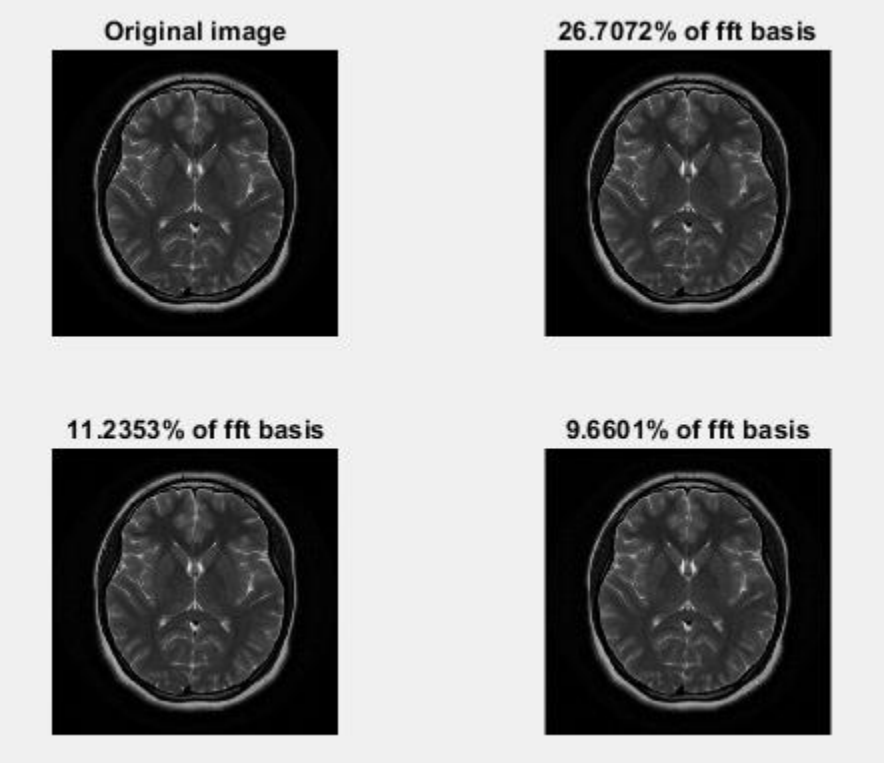
Question 2

Compress the image using Fourier Transform.

Code:

```
a=imread('MRI (1).png');
[row col] = size(a);
A=fft2(a);
count_pic=2;
subplot(2, 2, 1);imshow(a); title('Original image');
for thresh=0.1*[0.001 0.005 0.006]*max(max(abs(A)))

ind=abs(A)>thresh;

count=row*col-sum(sum(ind));

Alow=A.*ind;

per=100-count/(row*col)*100;

Blow=uint8(ifft2(Alow));

subplot(2,2,count_pic);

imshow(Blow);

count_pic=count_pic+1;

title([num2str(per) '% of fft basis'])

end
```

Output:



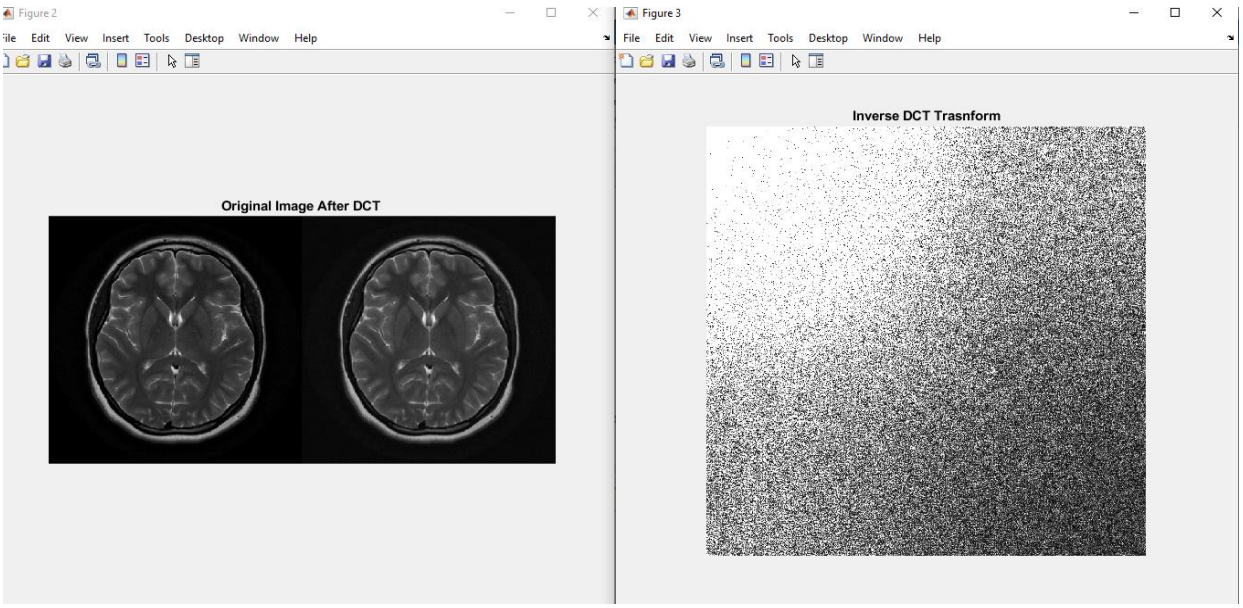
Question 3

Apply discrete cosine transform to transform an image from spatial domain to frequency domain. Apply inverse discrete cosine transform to transform the image from frequency domain to spatial domain.

Code:

```
image = imread('MRI.png');

image = im2gray(image);

compress = dct2(image);

imshow(log(abs(compress)),[])

compress(abs(compress) < 10) = 0;

K = idct2(compress);

K = rescale(K);

figure,montage({image,K});title('Original Image After DCT ');

inverseDct=abs(idct2(image))


figure,imshow(inverseDct);title('Inverse DCT Trasnform');
```

Output:



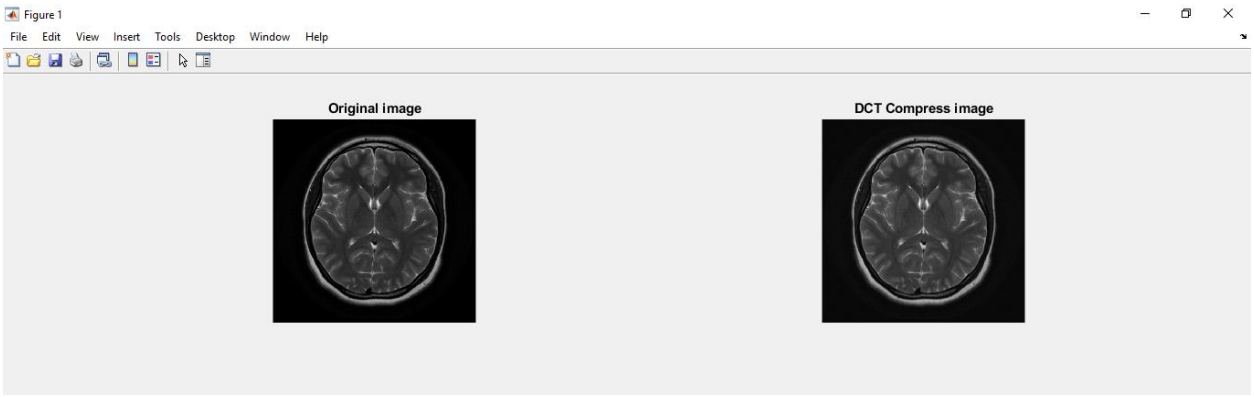
Question 4

Compress the image using Discrete Cosine Transform.

Code:

```
a=imread('MRI.png');
image = im2gray(a);
compress = dct2(image);
compress(abs(compress) < 10) = 0;
K = idct2(compress);
K = rescale(K);
subplot(221);imshow(a); title('Original image');
subplot(222);imshow(K); title('DCT Compress image');
```

Output:



Question 5

Compress the image using Haar Transform.

Code:

```
image_name = 'MRI.png';
delta = 0.0001;
disp(delta)
if (delta>1 || delta<0)
error('harr_wt: Delta must be a value between 0 and 1');
end
H1=[0.5 0 0 0 0.5 0 0 0;0.5 0 0 0 -0.5 0 0 0;0 0.5 0 0 0 0.5 0 0 ;0 0.5 0 0 0 -0.5 0
0 ;0 0 0.5 0 0 0 0.5 0;0 0 0.5 0 0 0 -0.5 0;0 0 0 0.5 0 0 0 0.5;0 0 0 0.5 0 0 0 -
0.5;];
H2=[0.5 0 0.5 0 0 0 0 0;0.5 0 -0.5 0 0 0 0 0;0 0.5 0 0.5 0 0 0 0;0 0.5 0 -0.5 0 0 0
0;0 0 0 0 1 0 0 0;0 0 0 0 0 1 0 0;0 0 0 0 0 0 1 0;0 0 0 0 0 0 0 1;];
H3=[0.5 0.5 0 0 0 0 0 0;0.5 -0.5 0 0 0 0 0 0;0 0 1 0 0 0 0 0;0 0 0 1 0 0 0 0;0 0 0 0
1 0 0 0;0 0 0 0 0 1 0 0;0 0 0 0 0 0 1 0;0 0 0 0 0 0 0 1;];
H1o = (H1.*(2^0.5));
H2o = (H2.*(2^0.5));
H3o = (H3.*(2^0.5));
```

```
Ho=normc(H1o*H2o*H3o);
H = H1*H2*H3;
x=double(imread(image_name));
len=length(size(x));
if len~=2
error('harr_wt: Input image must be a grey image, use "haar_wt_rgb" function to
compress RGB Images');
end
yo = zeros(size(x));
y = zeros(size(x));
[r,c]=size(x);
for i=0:8:r-8
for j=0:8:c-8
p=i+1;
q=j+1;
yo(p:p+7,q:q+7)=(Ho')*x(p:p+7,q:q+7)*Ho;
y(p:p+7,q:q+7)=(H')*x(p:p+7,q:q+7)*H;
end
end
figure;
imshow(x/255);
n1=nnz(y);
zo=yo;
m=max(max(yo));
yo=yo/m;
yo(abs(yo)<delta)=0;
yo=yo*m;


z=y;
y=y/m;
y(abs(y)<delta)=0;
y=y*m;

n2=nnz(y);
for i=0:8:r-8
for j=0:8:c-8
p=i+1;
q=j+1;
zo(p:p+7,q:q+7)=Ho*yo(p:p+7,q:q+7)*Ho';
z(p:p+7,q:q+7)=inv(H')*y(p:p+7,q:q+7)*inv(H);
end
end
figure;
subplot(121);
imshow(x/255);
title("original image");
subplot(122)
imshow(z/255);
title("compressed image");
imwrite(x/255,'orginal.tif');
imwrite(z/255,'compressed.tif');
compression_ratio = n2/n1;
```

Output: