COC202 Computer Vision
Lab 11 – Image compression/compressed domain retrieval – Solutions

1.

```
function dctdata = dctcompr(im, qf)
% DCT based image compression

qtables; % load quantisation tables
% get scaling of quantisation tables from q-factor (qf in [1;99])
if (qf < 50)
    q_scale = floor(5000/qf)/100;
else
    q_scale = (200 - 2*qf)/100;
end
% scale quantisation tables
qtab_lum = round(qtab_lum * q_scale);
qtab_chrom = round(qtab_chrom * q_scale);

nim = rgb2ycbcr(im); % RGB -> YCbCr
nim = double(nim);

for i=1:8:size(nim,1)
    for j=1:8:size(nim,2)
        for k=1:3
            imblock = nim(i:i+7,j:j+7,k); % 8x8 block in current channel
            dctblock = dct2(imblock); % now we have the DCT coefficients
            if (k==1)
                qdctblock = dctblock ./ qtab_lum; % luminance
            else
                qdctblock = dctblock ./ qtab_chrom; % chrominance
            end
            qdctblock = round(qdctblock); % round -> quantisation
            dctdata(i:i+7,j:j+7,k) = qdctblock; % copy to our output matrix
        end
    end
end
```

2.

```
function im = dctdecompr(dctdata, qf)
% DCT based image decompression

qtables; % load quantisation tables

% get scaling of quantisation tables from q-factor
if (qf < 50)
    q_scale = floor(5000/qf)/100;
else
    q_scale = (200 - 2*qf)/100;
end

% scale quantisation tables
qtab_lum = round(qtab_lum * q_scale);
qtab_chrom = round(qtab_chrom * q_scale);

for i=1:8:size(dctdata,1)
    for j=1:8:size(dctdata,2)
        for k=1:3
            dctblock = dctdata(i:i+7,j:j+7,k); % 8x8 DCT block in current
channel
            dctblock = double(dctblock);
            if (k==1)
                dqdctblock = dctblock .* qtab_lum; % luminance
            else
                dqdctblock = dctblock .* qtab_chrom; % chrominance
            end
            imblock = idct2(dqdctblock); % now we have pixel data
            nim(i:i+7,j:j+7,k) = imblock; % copy to our output matrix
        end
    end
end
nim = uint8(nim);
im = ycbcr2rgb(nim); % YCbCr->RGB
```

3.

```
% QBE with colour histograms in compressed DCT domain

imds = imageDatastore('*.bmp'); % create image datastore
imgs = readall(imds); % read in all images

for i=1:length(imgs)
    disp(sprintf('%2d - %s', i, imds.Files{i}));
    im = imgs{i};
    im = im(1:floor(size(im,1)/8)*8,1:floor(size(im,2)/8)*8,:);
    cim = dctcompr(im, 50); % DCT compress the image (qf=50)
    dcim = cim(1:8:size(cim,1),1:8:size(cim,2),:); % downsample by 8 to
get only DC data
    dcim = 2*dcim; % scale by 2 to better fit the data colourhist() expects
    allhists(i,:,:,:) = colourhist(dcim); % calculate histogram of DC data
end
sel = input('Select query image by number: ');

qhist = allhists(sel,:,:,:);
for i=1:length(imgs)
    mhist = allhists(i,:,:,:);
    sim(i) = histint(qhist, mhist);
end

[d, ind] = sort(sim, 'descend');
figure
for i=1:length(ind)
    subplot(10,10,i);
    imshow(imgs{ind(i)});
end
```