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```
% written by Shiv Kumar Gurjar (BT23ECE084)
% This code demonstrates JPEG image compression
% Part 1: Manual JPEG steps (DCT + Quantization)
% Part 2: JPEG compression using MATLAB built-in command

clc;
clear;
close all;
```

Read and preprocess image

```
img = imread('lena.png');
img = double(img);

if ndims(img) == 3
    img = rgb2gray(uint8(img));
    img = double(img);
end

img = img - 128;    % Level shifting
[M,N] = size(img);
```

JPEG Quantization Matrix (Standard)

```
Q = [16 11 10 16 24 40 51 61;
      12 12 14 19 26 58 60 55;
      14 13 16 24 40 57 69 56;
      14 17 22 29 51 87 80 62;
      18 22 37 56 68 109 103 77;
      24 35 55 64 81 104 113 92;
      49 64 78 87 103 121 120 101;
      72 92 95 98 112 100 103 99];
```

Manual JPEG Compression

```
compressed = zeros(M,N);

for i = 1:8:M
    for j = 1:8:N
        block = img(i:i+7, j:j+7);
        dct_block = dct2(block);
        quant_block = round(dct_block ./ Q);
        dequant_block = quant_block .* Q;
```

```

    idct_block = idct2(dequant_block);
    compressed(i:i+7, j:j+7) = idct_block;
end
end

manual_jpeg = compressed + 128;
manual_jpeg = uint8(manual_jpeg);

```

JPEG Compression using MATLAB Command

```

imwrite(uint8(img+128), 'jpeg_builtin.jpg', 'jpg', 'Quality', 30);
builtin_jpeg = imread('jpeg_builtin.jpg');

```

Display Results

```

figure;
subplot(1,3,1);
imshow(uint8(img+128));
title('Original Image');

subplot(1,3,2);
imshow(manual_jpeg);
title('Manual JPEG Compression');

subplot(1,3,3);
imshow(builtin_jpeg);
title('JPEG using imwrite');

```



