

```

%{
Explanation:
rgb2gray: Converts an RGB image to grayscale if necessary.
double(img_gray) / 255: Normalizes the image to the range [0, 1].
imresize(img_gray_norm, scaling_factor, 'nearest'): Reduces the number of grayscale
levels
by downsampling and then upsampling the intensity values.
A scaling factor of 1/8 effectively reduces the image to 32 levels because  $256 = 32 \times 8$ 
= 3225=32.
uint8(img_rescaled * 255): Converts the normalized image back to
8-bit grayscale (values in the range [0, 255]).
%}

% Load a grayscale image
img = imread('bookpage.jpg'); % Replace with your image file

% Convert to grayscale if necessary
if size(img, 3) == 3
    img_gray = rgb2gray(img);
else
    img_gray = img;
end

% Normalize the grayscale image to the range [0, 1]
img_gray_norm = double(img_gray) / 255;

% Rescale the image using imresize to quantize to 32 levels
scaling_factor = 1/8; % This factor reduces the levels to 32 ( $2^5 = 32$  levels)
img_rescaled = imresize(img_gray_norm, scaling_factor, 'nearest');
img_rescaled = imresize(img_rescaled, size(img_gray_norm), 'nearest');

% Convert back to [0, 255] range and round to nearest integer
img_quantized = uint8(img_rescaled * 255);

% Display the original and quantized images
figure;
subplot(1, 2, 1); imshow(img_gray); title('Original Grayscale Image');
subplot(1, 2, 2); imshow(img_quantized); title('32 Grayscale Levels Quantized
Image');

```

**Original Grayscale Image**



**32 Grayscale Levels Quantized Image**

