1 a) Does it work well for both the images? If not, why?

Ans: No, it won't work same for both image because when choosing appropriate gain value if pixels histogram is limited only to certain band it can stretch out to entire 0 – 255 range but when you have small number of pixels in both limits, we can't stretch the image without loss using linear contrast stretch.

Here we have tiny light sources in image that represents the 255 intensity pixels are non-zero. Since it is dark image limits exits on both boundaries so we can't stretch with liner contrast stretch

1 b) Did it overcome the limitation of linear contrast stretching? If yes, then why?

Ans: Yes, since it is nonlinear stretch, we can choose that nonlinear curve that stretches the required area without losing boundary pixels.

Here we are choosing the exponent which is < 1 and it stretches the low intensities leaving higher intensities same level

1 c) What all issues do you notice in the enhanced images? How does the enhanced version of LowLight_3.png look? Plot the histograms of the images and note how is the histogram of LowLight_3.png different from those of other images. Can you now argue as to why the enhanced version of LowLight_3.png looks the way it looks?

Ans: All images are stretched to all intensities and all histograms are nearly uniform. But enhanced version of low light image 3 is having only very few bins that to near to the dark intensities in histogram. which results when we do AHE, so when we stretch it maps the dark intensities to some higher intensity region. Because of very few intensity bins are present image appears as hazy. Making histogram uniform is not quite good process since after taking CDF of low light image 3 it won't appearing as required

1 d) What observations can you make about visibility of the image obtained by this method with that of part (c). Compare in terms of visibility, the difference between overlapping and nonoverlapping CLAHE method.

Ans: Doing AHE in blocks is enhanced the image without stretching neighbor intensities too far. We have faced the problem when we have only darker intensities except some tiny pixels at bright region doing AHE stretches the image and makes image somewhat hazy like in the case of 1.c Lowlight image 3 but doing blockwide AHE and selecting appropriate clipping it made too dark intensities to dark side only.

As compared visibility with overlapping and non-overlapping, overlapping gives the best visibility since it gives the AHE of overlapped blocks it can make sure that intensity stretch not only neighbor pixels but also neighbor blocks. Which makes our image more clean.

2) Compare the histogram of that stretched image obtained in saturated contrast stretch method with that of histogram obtained by applying linear contrast stretch

Ans: As math book image have 3 RGB layers three layers don't have same intensities and most of them has darker side intensities with very small percentage of brighter side when we apply linear stretch it will consider the bright pixels into account and won't do the contrast stretch much. But without stretching darker side pixels to some high level we can't get good image since saturating the too bright and too dark intensities for some percentage we are left with image good information pixels to stretch wide range.

3) Which interpolation method gives better results visually in resizing

Ans: Bilinear interpolation giving the best results compared to the nearest neighbor because it is taking weighted average to neighbor pixels, instead nearest neighbor putting exact value of nearest pixel. Comparatively taking one nearest neighbor pixel value is not better than weighted average go 4 neighbor pixels which makes the image smooth.