Q2.

**(i)**

Since our Initial Pixel values are n a range of 290 to 3000, we have to perform Normalization for Contrast Stretching them to enhance it to 0 to 65535 range.

Let’s take I as initial dataset, where,

Max = 3000 (Maximum pixel value in the set)

Min = 290 (Minimum pixel value in the set)

Now, to normalize the data,

where, *I= Any random value which we want to normalize*

*NewMax = Maximum intensity value of new Intensity range*

*NewMin = Minimum intensity value of new Intensity range*

*Max = Maximum intensity pixel value of given range*

*Min = Minimum intensity pixel value of given range*

We have,

NewMax = 65,535

NewMin = 0

Max = 3000

Min = 290

Therefor,

For example,

(1) I = 3000

*I’ = 65535*



(2) I = 300

*I’ ≈ 242*

(3) I = 1000

*I’ ≈ 17,170*

In the above problem we learned that Contrast Stretching Normalization is a transformation technique used in Image Processing, in which we enhance or diminish the the pixel intensity of our greyscale image from the given range to desired range. In our problem we have 290 to 3000 as our given pixel range and 0 to 65535 as desired pixel range (As we want to represent in a 16-Bit binary number. So, it’s range is 0-65535). So, we are enhancing the quality of our image by representing it in a 16 bpp image in such a way that every bit of our display is filled by a pixel and making the image more clear.

**(ii)**

We are given,

x = (-∞,∞)

and we have to transform our data values into the range of (0,1)

To perform our transformation we will use Min-Max Scaling to normalize our data.

In Min-Max-Scaling,

where, *xi = value in the range we want to normalize*

*xmin = minimum value in the range*

*xmax = maximum value in the range*

Let’s take an example,

x = (-100,100)

here,

xmin = -100

xmax = 100

But xi can’t be -100 or 100 as it is an open set.



(1) Take x1=50

*z1= 0.75*

(2) Take x2=-90



*z2 = 0.05*

Here, x1>x2 and we get z1>z2. Therefore, condition satisfied and we will get unique values for every value of x.

//If it’s a closed set, we can take xmin as minimum-1 and xmax as maximum+1.