Task 3 : ลองทำ Histogram Equalization

In [9]:

```
import cv2
import numpy as np
import matplotlib.pyplot as plt
```

Step 1 : Create an image

In [10]:

```
img = np.array([[5,3,1,0,1],
               [0,2,1,0,5],
               [1,5,0,1,2],
               [4,2,6,2,1],
               [6,2,0,1,5]]
               )
print(img)
```

```
[[5 3 1 0 1]
 [0 2 1 0 5]
 [1 5 0 1 2]
 [4 2 6 2 1]
 [6 2 0 1 5]]
```

Step 2 : Histogram Equalization

Find the cumulative distribution function (CDF)

Since all the pixels are integers(all pixels are 3-bit (0-7)), we can use the histogram function to find the CDF. The CDF is the sum of the histogram up to a particular bin, normalized to the range [0,1].

In [11]:

```
hist, bins = np.histogram(img, 8 , [0,8])
print(f'hist = {hist} , bins = {bins}')
```

```
hist = [5 7 5 1 1 4 2 0] , bins = [0. 1. 2. 3. 4. 5. 6. 7. 8.]
```

In [12]:

```
prop = hist/np.sum(hist)
print(f'prop = {prop}')
```

```
prop = [0.2  0.28 0.2  0.04 0.04 0.16 0.08 0.  ]
```

In [13]:

```
cdf = prop.cumsum()
print(f'cdf = {cdf}')
```

```
cdf = [0.2  0.48 0.68 0.72 0.76 0.92 1.   1.  ]
```

Find the transfer function

In [14]:

```
maxVal = 7 # L-1 (L = 8 or 2^3)
print(f'maxVal = {maxVal}')
S = np.floor((cdf*maxVal)).astype(int)
print(f'S = {S}')
```

```
maxVal = 7
S = [1 3 4 5 5 6 7 7]
```

Apply the transfer function to the image

In [15]:

```
imgnew = S[img]
```

Step 3 : Show the result

In [16]:

```
print(f'imgnew = \n {imgnew}')
```

```
imgnew = 
 [[6 5 3 1 3]
 [1 4 3 1 6]
 [3 6 1 3 4]
 [5 4 7 4 3]
 [7 4 1 3 6]]
```