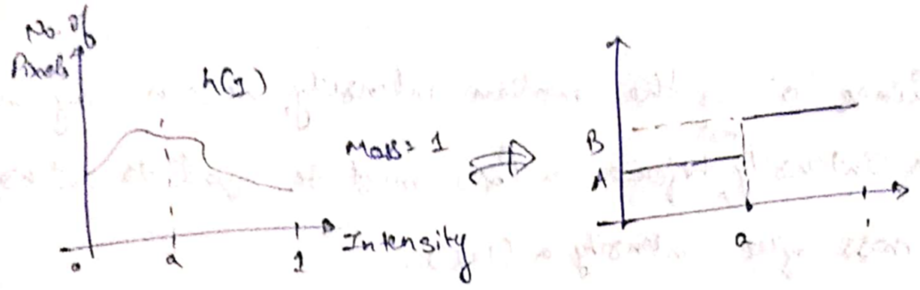
CS 663 – Assignment 1 – Part 3

(a)

Q.3]

(a)



After Equalisation,
Since, Mass give of $h_1(I)$ will be α,

$$A \cdot a = \alpha$$
$$\therefore A = \frac{\alpha}{a}$$

Since total mass is preserved,
After Histogram Equalisation, Mass contained by h_2 will be $(1-\alpha)$

$$\therefore (1-\alpha) = B \cdot (1-a)$$
$$\therefore B = \left(\frac{1-\alpha}{1-a}\right)$$

Mean $= \int x \cdot \text{Probability}$

$$\therefore \text{Mean Intensity} = \int_0^a x \cdot \left(\frac{\alpha}{a}\, dx\right) + \int_a^1 x \cdot \left(\left(\frac{1-\alpha}{1-a}\right) dx\right)$$

$$= \left(\frac{\alpha}{a}\right)\left(\left[\frac{x^2}{2}\right]_0^a\right) + \left(\frac{1-\alpha}{1-a}\right) \frac{x^2}{2}\Big|_a^1$$

$$= \frac{\alpha a^2}{2a} + \left(\frac{1-\alpha}{1-a}\right) \frac{(1-a)(1+a)}{2}$$

$$= \frac{a\alpha + (1-\alpha)(1+a)}{2}$$

$$= a\alpha + 1 - a\alpha + a - \alpha \;/2$$

$$\text{Mean Intensity} = \frac{1+a-\alpha}{2}$$

Mean Intensity = $(1 + a - \alpha) / 2$

(b)

(b) Since 'a' is the median intensity, we can say that ~~total~~ Intensity mass before 'a' (α) must be equal to intensity mass after intensity a $(1-\alpha)$.

$$\therefore \alpha = 1-\alpha$$

$$\therefore \alpha = \frac{1}{2}.$$

Substituting the value in previous question,

$$\text{Mean Intensity} = \frac{1+a-\alpha}{2}$$

$$= \cancel{\frac{2+2a}{4}} = \frac{1+2a}{4}$$

(c&d)

α = 1/2

Mean Intensity = (1 + 2a) / 4

(c)
In images like black and white patterns, normal HE will tend to dissolve the pattern by processing blacks and whites together. But median HE will process them separately so it will preserve the pattern.
So here median HE will perform better

(d)