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BE A

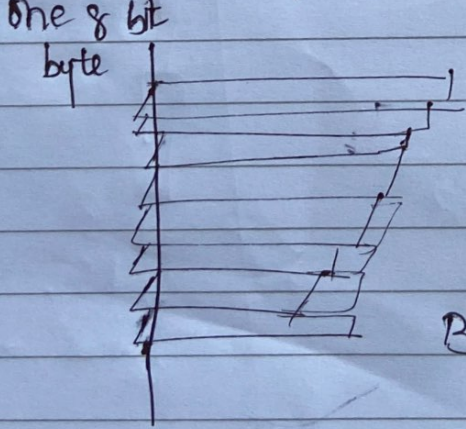
DSIP DT-2

Q2]

① Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis

② Image enhancement can be done in two domains:
- spatial domain
- frequency domain.

I) Bit plane slicing
- Pixels are digital numbers, each one composed of bits
- Instead of highlighting gray-level range, we could highlight the contribution made by each bit
- For an 8 bit gray level, the image is composed of 8 1 bit planes.



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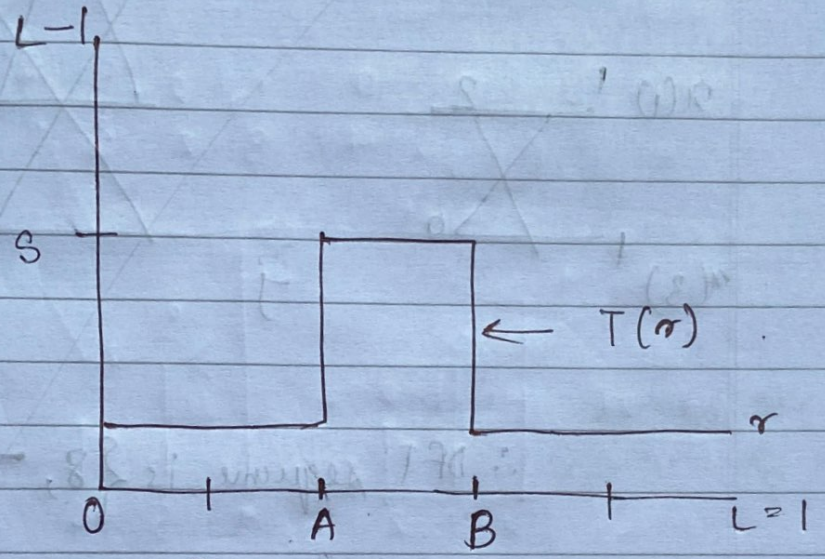
II) Grey level slicing

- This technique is used to highlight a specific range of gray levels in a given image
- Displays a high value for all gray levels in the range of interest and a low value for all other gray levels.



$$s = \begin{cases} L; A \leq r \leq B \\ 0; \text{otherwise.} \end{cases}$$

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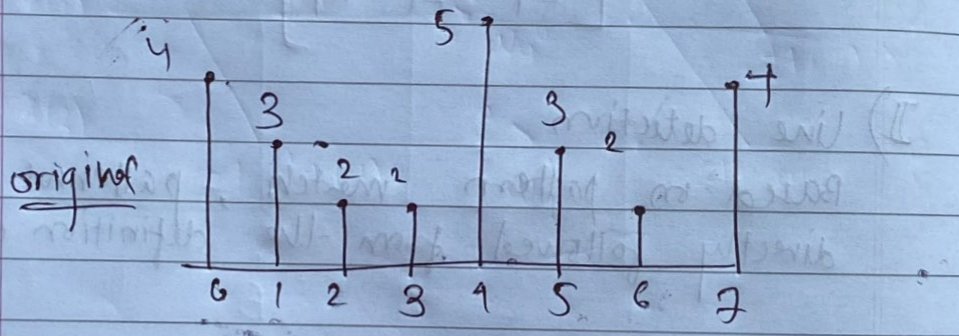
Q1) An 8 level image is given below.

4	6	0	3	7
2	1	5	0	3
4	2	7	0	7
1	5	4	6	0
4	7	5	4	1

Gray levels	0	1	2	3	4	5	6	7
no of pixels	4	3	2	2	5	3	2	4



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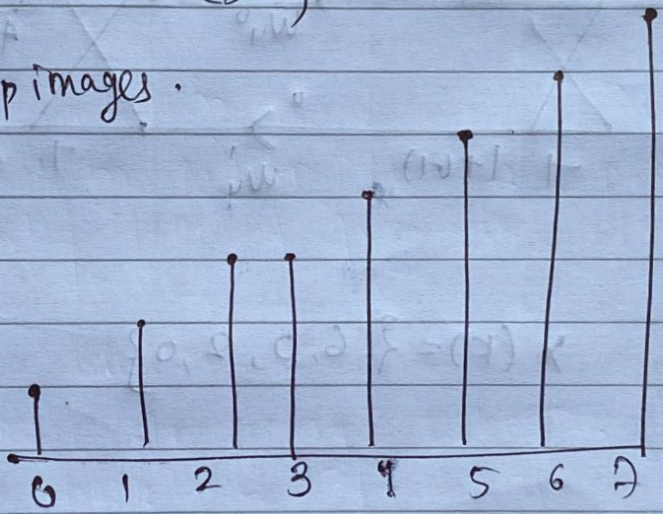
Gray level	no of pixel	PDF	CPF	8x7	Highest
0	4	0.16	0.16	1.12	1
1	3	0.12	0.28	1.96	2
2	2	0.08	0.36	2.52	3
3	2	0.08	0.44	3.08	3
4	5	0.2	0.64	4.48	4
5	3	0.12	0.76	5.32	5
6	2	0.08	0.84	5.88	6
7	4	0.16	1	7	7

N=25
(sum)

• p images.



equalized image

4	6	1	3	7
3	2	5	1	3
4	3	7	1	7
2	5	4	6	1
4	7	5	4	2

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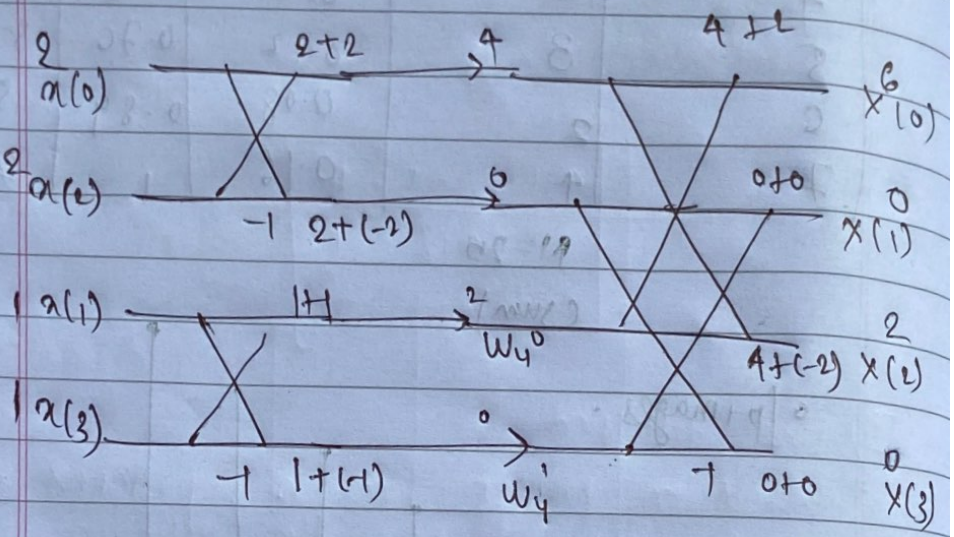
Q3].

$x(n) = \{2, 1, 2, 1\}$

$W_4^0 = e^{0} = 1$ $\quad W_4^1 = -j$



$X(K) = \{6, 0, 2, 0\}$

Q4)

- There are 3 basic types of discontinuities: points, lines and edges.
- The detection is based on convoluting the image with a spatial mask.
- A general 3×3 mask

$$\begin{bmatrix} w_{-1,-1} & w_{-1,0} & w_{-1,1} \\ w_{0,-1} & w_{0,0} & w_{0,1} \\ w_{1,-1} & w_{1,0} & w_{1,1} \end{bmatrix}$$

- The response of the mask at any point (x,y) in the image is

$$R_{xy} = \sum_{i=-1}^{1} \sum_{j=-1}^{1} P(x-i, y-j)\, w(i,j)$$

Image segmentation is the process of partitioning a digital image into multiple segments

Discontinuity approach: This approach relies on the discontinuity of pixel intensity values of the image. Line, point, and edge detection techniques use this type of approach for obtaining intermediate segmentation results which can be later processed to obtain the final segmented image.

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Q4)

I) Point detection
A point has been detected at the location p(i,j) on which the mask is centered if $|R| > T$, where T is a non-negative threshold and R is obtained with the following mask.

$$\begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$$

II) Line detection
Based on pattern match, patterns are directly followed from the definition of line

III) Edge detection
- Image processing technique for finding the boundaries of objects within images.
- locates sharp changes in the intensity function.