Chapter = 3   (1@)
Images and Graphics

i) Define image. (explain digital image too)
→ An image is a visual representation of something.
→ Images can be collected by digital cameras or created using software.
→ These images can take form of photographs, graphics, etc.

2) What do you mean by digital image?
→ Digital image is a binary representation of visual data.
→ It can be represented as 2 dimensional matrix of pixels. i.e $j[x][y]$ numeric
→ Each pixel consists of digital value of one or more bits. The digital value may represent brightness, color intensity, etc.
→ The digital image can be stored on any storage devices.
→ The advantage of digital image is that it can be processed in many ways, by computer system.
→ The file extension of images are jpeg, pr, gtiff, etc.

1) How is image represented in computer system?

→ Images need to be converted into binary in order for a computer to process them so that they can be seen in our screen.

→ Since image is a binary representation of visual data, it can be represented as 2 dimensional matrix of pixels.   I[x,y]

→ Each pixel consits of digital value of one or more bits.

→ The digital value may represent brightness, color, intensity, etc.

→ Generally, each pixel stores a color.

→ Computers can show millions of colors.

→ ~~Colors are~~ millions of colors can be represented as a combination of only 3 primary colours red, blue and green. (RGB model)

→ Each pixel stores 3 values corresponding to the amount of each color.

→ Each color can get value between 0 to 256. where 0 is white & 256 is black.

14) Explain the different types of image format

→ There are two types of image format :-
i) Captured Image format
ii) Stored Image format

i) Captured Image format
Ans: It is a raw image format that comes out from an image grabber. (camera)
→ Image capturing is the process of obtaining a digital image from a camera.

ii) Stored Image format
→ While storing an image, we store a 2-dimensional array of values i.e matrix.
                    → pixel
→ Status Each pixel consists of digital values like brightness, color, intensity, etc.
→ The image will be compressed before storage for saving storage space.
→ Some file formats of storing images are:
    ⊕ JPEG, TIFF, PNG etc.

IIIII 5) Write down the steps of Image Recognition. Explain each step with suitable diagram.

Ans: Image recognition is a technology that enables us to identify objects, people, entities etc in an image.

→ It is used in many application like defect detection, medical imaging and security survelliance.
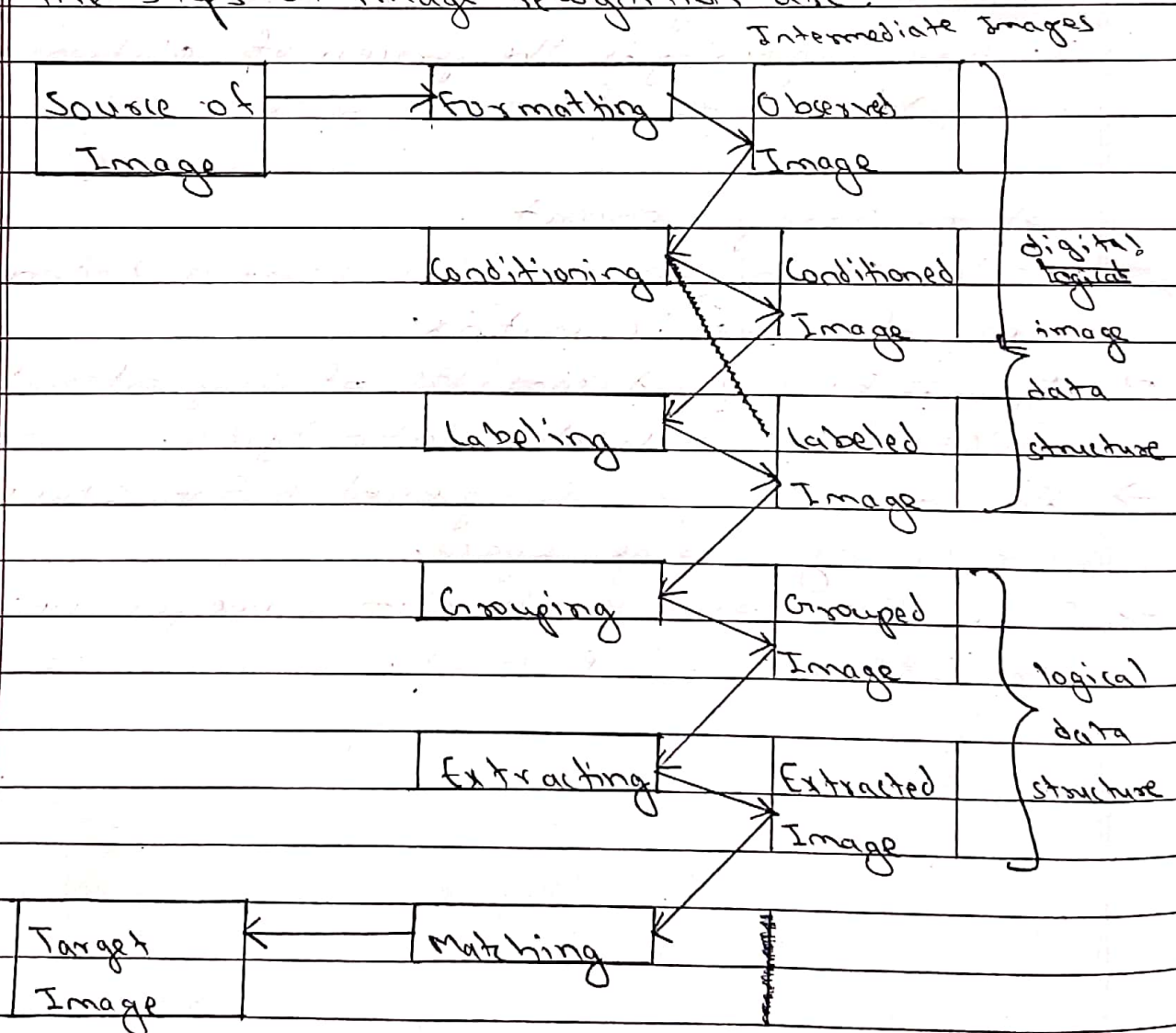
→ The steps of image recognition are:-

Intermediate Images

Source of Image	→	Formatting	→	Observed Image
Conditioning		Conditioned Image
Labeling		Labeled Image
Grouping		Grouped Image
Extracting		Extracted Image
Target Image	←	Matching

digital logical image data structure

logical data structure

fig. Steps of Image Recognition

There are 6 steps of image recognition :-
i) formatting   iv) Grouping
ii) conditioning   v) Extracting
iii) Labeling   vi) matching

i) formatting
→ It refers to capturing an image from a camera and bringing it into a digital form.
→ i.e generating a digital representation of an image in the form of pixels.

ii) conditioning
→ The image usually contains some unwanted variations that makes the recognition process difficult and complex.
→ Conditioning is the process in which such unwanted variations are eliminated or suppressed so that they do not have influence over the recognition process.

iii) Labeling
→ Informative patterns in an image have structure.
→ Edge detecting is an example of labeling in which the boundary of the object of interest is determined.

iv) Grouping
→ Grouping involves arranging the pixels of the edges so that they produce some meaningful shape and structure.

→ The edges may be grouped into lines, curves may be grouped into to form circle or any other structure.

v) Extracting
→ Extraction is ~~the~~ a process in which the data and attributes related to the images are calculated.

vi) ~~Extracting~~ Matching
→ finally, once the pixels in the image have been grouped into objects, the final step is to recognize the objects in the image.
→ Matching involves comparing each object in the image with previously stored models.

6) Explain different image transmission possibilities.
Ans. Image transmission is the process of transmission of digital images through computer networks.
→ Requirements on networks when images are transmitted:-
   1) The network must accomodate bursty data transport
   2) Reliable transport.

→ Image transmission possibilities
   1) Raw image data transmission
      ↳ transmission of image before compression.
   2) Compressed image data transmission
      ↳ transmission of image after compression.

17) What is image processing ? Explain the various application areas of image processing.

Ans: Image processing is a method to perform some operations on an image, in order to get an ~~enhanced~~ enhanced image or extract some useful information from it.

→ The applications of image processing are :-

i) Medical Image Retrieval (medical field)
→ Image processing is used in medical research.
→ It is used for various tasks like X-ray Imaging, Cancer cell image processing, etc.

ii) Image Reconstruction
→ Image processing can be used to recover and fill in the missing or corrupt parts of an image.

iii) Face Detection
→ One of the most common application of image processing we use today is face detection.

iv) Pattern Recognition
→ Image processing is used to find out various patterns in an image.
→ It is used extensively in AI and Machine Learning

v) filtering Images on Social media
-> It is popular these days.

vi) Sharpening the image
vii) Video Processing

12) Image Enhancement

Ans: The process of improving the quality of a digitally store image by manipulating it with software is known as image enhancement.

-> It is done for better analysis of image.

-> It may be removing the noise or improving the contrast

-> It is quite easy.
  for example: To make an image lighter or darker, increase or decrease image contrast.

-> Advance enhancement software supports many filters for altering images in various ways.