MID exam

1) Discuss the significance of sampling & quantization in processing of digital image. (1)

The digital image capturing process mostly use the CCD (charge coupled sensor). The o/p of most of the image sensor is an analog signal, & we can't apply digital processing on it because we could store it because it requires infinite memory to store a signal that can have infinite values. It is impossible.

So we have to convert an Analog signal into Digital.

To create an image which is digital, we need to convert continuous data into Digital form. There are 2 steps.
1) sampling   2) Quantization

1) Sampling. This process takes samples as digital signal over x-axis. Sampling is done on an independent variable (x). We can also say that the conversion of x-axis (infinite values) to digital is done under sampling.

(y) voltage   sample points
                        time (x) →

sampling is further divided into 1) op sampling & ii) down sampling. If the range of values on x-axis are less then we will use the up sampling of values. This is known as op sampling & vice versa is down sampling.

2) Quantization : It is the process of dividing the signal/wave into Quantus (partitions). It is done on dependent variable. It is opposite of sampling.
In case of this mathematical equation y = sin(x).
It is done on y-axis. The conversion of y-axis infinite values to 1, 0, -1 (or any other level) is known as Quantization

1
y-axis
0   x-axis

2) Discuss the importance of Img-preprocessing in understanding the digital image data (4)

=) Image-preprocessing is one of the step of Digital Image processing. It involves operations on images at the lowest level of abstraction where both I/P & O/P images are intensity images. The main aim of preprocessing is an <u>improvement</u> of the image data that eliminates distortions or enhance some image features suitable for further processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image such as, changing brightness & contrast etc)

* The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important further processing

4- categories of Img preprocessing methods according to the size of neighborhood that is used for calculation of a new pixel brightness:

i) Pixel brightness transformations,
ii) Geometric transformations
iii) Methods that use a local neighborhood of the processed pixel.
iv) Image restoration that requires knowledge about the entire image.

EX!
For ex. If we are doing Remote sensing proces from air to surface of our aim is to find the vehicles on the Road; but when we aquisite/capture the image from the air, may be some obstraction like cloud particles of Trees near to Road distorbs us. So at that kind of cases needed preprocessing techniques for improving images.

3) Justify "Image Analysis & Understanding is an useful task for better society building". (4) # Applications

=) DIP is used in Waste fields today. Many of the fields using DIP techniques for improving the performance of their work & productivity of the work.

=> Image is better than any other information / Thousands of lines of text. for Human to perceive.

Today we using DIP to automate many of stuffs in our society, There are plenty of Applications which very useful to our society.

1) **Agriculture** :- In this field DIP used for many sections, for Harvesting, For cleaning, for Quality inspection, For disease identification and so on.

For fruit Harvesting, DIP p techniques are really helpful As the taking an image of a three or specifically fruit, then the Harvesting machine (Like drone) can pluck the specific fruit.

Also it is useful for yield detection & Quality inspection (like checking the quality of Grains).

2) **Remote Sensing** : It is one of the most popular application of DIP, that used for several purposes like Defence, Road traffic management.

3) **Medical Field** : In medical field, DIP uses for many purposes like,. # identifying or studying disease. medical imaging developing rapidly due to developments in Images & processing techniques include Image Recognition, Analysis, & Enhancement. It also use increases the percentage & Amount of detected tissues.

4) **Security & surveillance** : It can be used for monitoring of the behaviour, Activities or other changing information, usually people it is very useful to govt & Law enforcement to maintain social control, Recognize & Monitor threats, & prevent / investigate criminal activities.

4) Discuss the importance of Biometric technology, considering the current App's (4)

=) Biometric technology used many fields today. It is basically used for security, Identity validation. Such as in Banking, Voter's Identity verification.

Recently Govt. of India also adopted this technique for UIDAI (Adhaar, Govt gives the unique Id based on civil's unique Identification/ Biometric characteristics like Iris data, Fingerprint. and photo of the civil, so that they can give unique IP. to each civilian of the country through Adhaar card, This Biometric information is stored in Govt. Databases.

In Banking, the Biometric information of the card account holder or locker holders are easy to secure Authentification.

Mainly Biometric technology used in Forensic Investigation So that investigation can easily investigate, monitor behavior of the criminal.

Many security verification involves the face Recognition, Iris recognition were the part of Biometric technology.

5) Image "Representation" (Explain) (4)

⇒ It is one of the step (or last step) of the DIP. Representing or interpreting the image based on already stored knowledgebase.

since capturing an image from a camera is a physical process. The sunlight is used as a source of energy. A sensor array is used for aquisition of the image. So when the sunlight falls upon the object, then the amount of light is reflected by that object is sensed by the sensors, & a continous voltage signal is generated by the amount of sensed data. In order to create a digital image, we need to convert the data into a digital form.

selecting a good representation is only part of the solution for transforming image data into a form suitable for succeeding processing. Description is also called feature extraction that deals with extracting attributes that result in some quantitative information of interest ⊘ are basic for descriminating one class of objects from another. The feature extraction needed to perform classification of object under observation

Features are those items which uniquely describe an object such as its size, shape, composition, location etc, measurable quantities of object features allow desciption & classification of image. So "Representation" important step for DIP.