

Assignment : 04

Q1. What is an instrumentation system? Define its type. What component used in an analog data acquisition system?

Ans. The systems, used for data acquisition are known as data acquisition systems. These data acquisition systems will perform the tasks such as conversion of data, storage of data, transmission of data and processing of data.

Data acquisition systems consider the following analog signals:

- Analog signals, which are obtained from the direct measurement of electrical quantities such as DC and AC Voltages, DC and AC currents, resistance and etc.
- Analog signals, which are obtained from transducers such as LVDT, Thermocouple and etc.

There are two types of data acquisition systems

- Data Analog Data Acquisition System.
- Digital Data Acquisition System.

Analog Data Acquisition system:

The data acquisition systems, which can be operated with analog signals are in as analog data acquisition systems.

Following are the blocks of analog acquisition systems.

Transducer: It converts physical quantities into electrical signals.

Signal conditioner: It performs the function like amplification and selection of desired portion of the signal.

Display device: It displays the input signals for monitoring purpose.

Graphic recording instruments: These can be used to make the record of input data permanently.

magnetic tape instrumentation; It is used for acquiring, storing and reproducing of input data.

Digital Data Acquisition Systems.

The acquisition systems, which can be operated with digital signals are known as digital data acquisition system. So, they use digital components for storing or displaying the information.

Mainly, the following operations take place in of digital data acquisition.

- Acquisition of analog signals
- Conversion of analog signals into digital signals or digital data
- Processing of digital signals or digital data.

Following are the blocks of Digital data acquisition systems.

Transducer: It converts physical quantities into electrical signals.

Signal conditioner: It performs the function like amplification and selection of desired portion of the signal.

Multiplexing connects one of the inputs to outputs, so it needs parallel to serial connection.

Analog to Digital Converter: Q4
Converts the analog input into equivalent digital input.

Display device: It displays the data in digital format.

Digital Recorder: It is used to record the data in digital format.

Q2. Define digital data acquisition system. What are the uses of data acquisition system?

A data acquisition system is a collection of software and hardware that allows one to measure or control the physical characteristics of something in the real world.

A complete data acquisition sys. consists of DAQ hardware, sensors and actuators, signals conditioning hardware, and a computer running DAQ software.

The DAS plays an important role in any monitoring system and is used to collect data from diff. sensors of a PV system. Then, this data is digitalized for storage and the DAS sends data to the control center for processing and presentation.

Q3. Explain the construction and working of Liquid ~~crystal~~^{crystal} Display LCD Define their advantages and disadvantages

Definition: The LCD is defined as the diode that uses small cells and the ionised gases for the production of images. The LCD works on the modulating property of lights. The light modulation is the technique of sending and receiving the signal through the light. The liquid crystal consumes a small amount of energy because they are the reflector and the transmitter of light. It is normally used for seven segmental display.

Continuation :

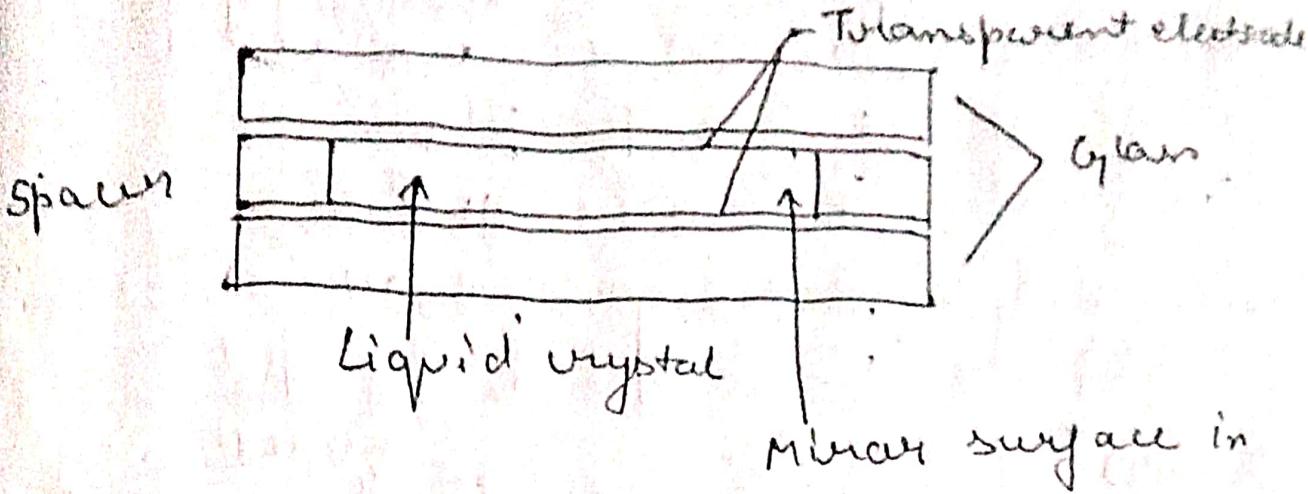
The liq. crystals are the organic compound which is in liquid form and shows the property of optical crystals. The layers of liquids crystals is deposited of the inner surface of glass electrodes for the scattering of light. The liquid crystals cell is of two types

- Transmittive Type
- Reflective type.

Transmittive type: In transmittive cell both the glass sheets are transparent so that the light is scattered in the forward direction when the cell becomes active.

Reflective type.

The reflective type cell consists the reflective surface of the glass sheet on one end. The light incident on the front surface of the cell is scattered by this activated cell.



Working :

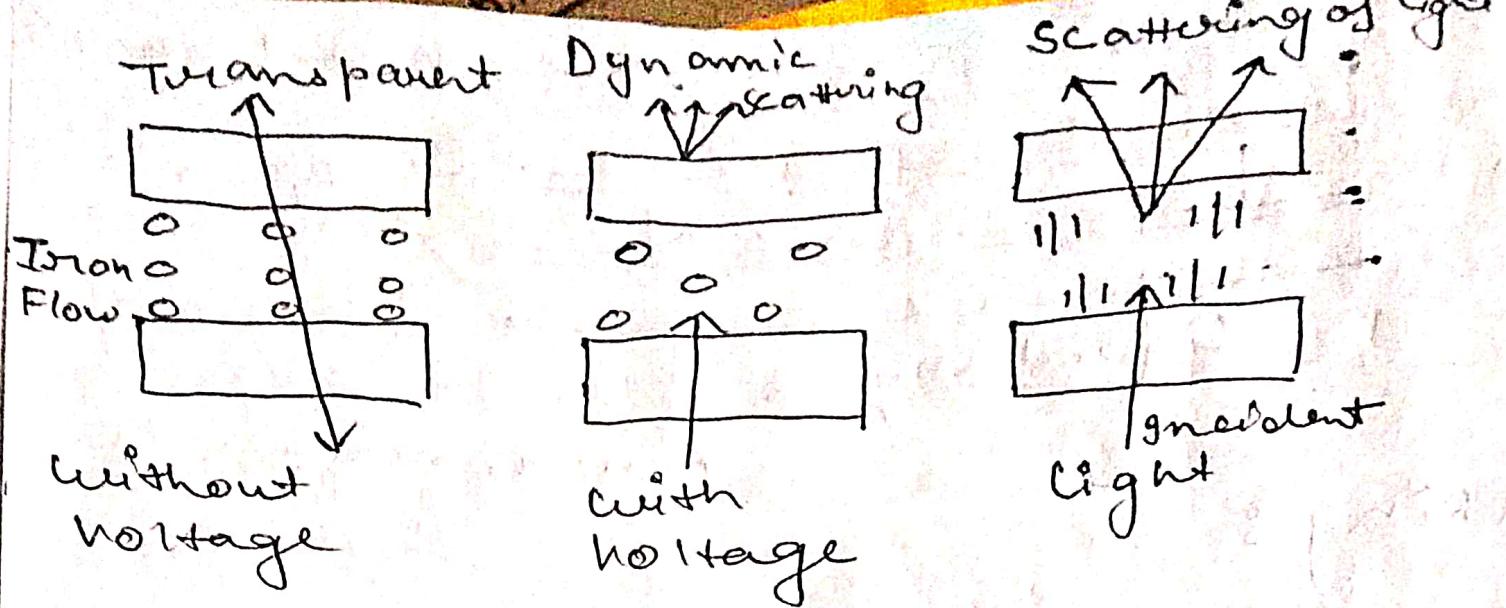
LCD working is of two types:

Dynamic scattering (DS)

When the potential carrier flows through the light, the molecular alignment of the liquid crystal disrupts, and they produce disturbance. The liquid becomes

disrupts, and they produce disturbance. The liquid becomes transparent when they are not active. But when they are active their molecules turbulence causes scattered of liquid in all directions, and their cell appears bright.

This type of scattering is known as the dynamic scattering.



Field Effect Type.

Construction is same as DS, only difference is that the two thin polarising optical fibres are placed inside the each glass sheet.

Field Effect Type uses the nematic material which twists the unenergised light passing through the cell.

The light after passing through the nematic material passing through the optical filters and appears bright, when the cell has energised no twisting of light occurs, and the cell appears dull.

Advantages :

- i) power consumption is low.
- ii) The cost of the LCD is low

Disadvantages :

- i) LCD requires the large area
- ii) The LCD is a slow device becoz their turning on and off time are quite large.
- iii) the DC current reduces the lifespan of LCD. The LCD use with AC supply having the freq. less than 500Hz.

Q4. Explain LVD i.e. Liquid Vapor Display.

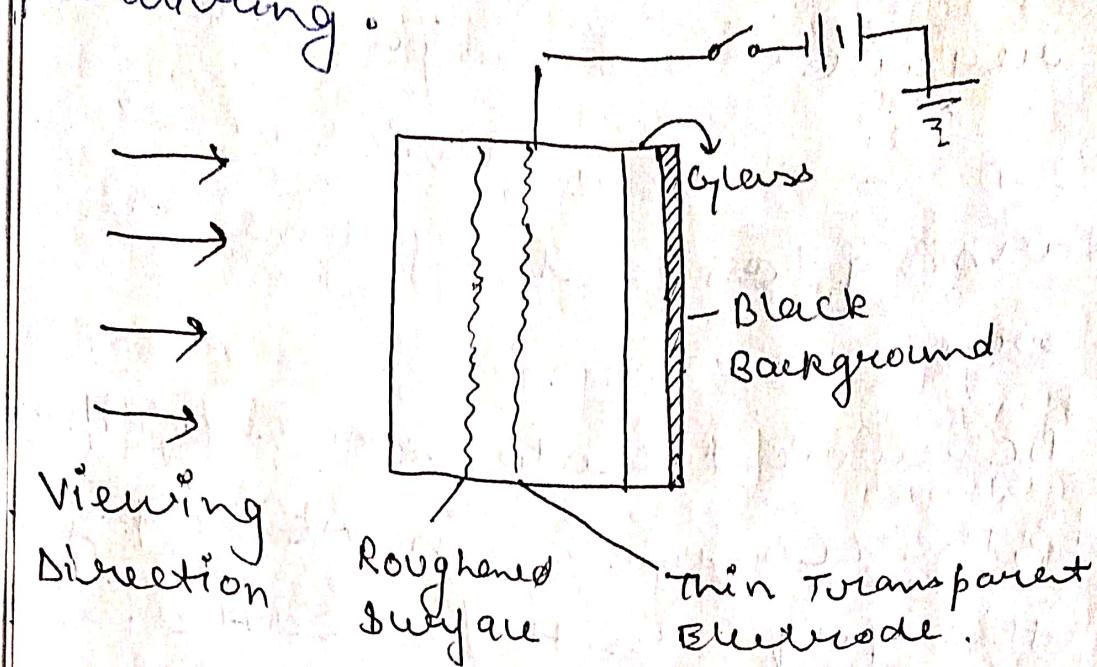
Ans. LVD are the latest in economical display technology.

They operate on the principle of a reflective passive display and depend on the presence of ambient light for their working.

Advantages

- i) This makes it a simple display devices. This has a better contrast ratio as compared to LCD, but its speed of operation is low.

ii) Due to refractive index vapour is roughly unity, there is a discontinuity established b/w the front glass plate and the liquid, which results in light scattering.



Q4. Describe the difference b/w light scattering and field effect types of LCDs.

Ans. The construction of liquid crystals is similar to that of the dynamic scattering type the only difference is that in Field effect type LCD the two thin polarizing optical fibres are placed inside the each glass sheet.

The liquid crystals used in field effect LCD's are of different scattering types that operated in the dynamic scattering cell.

The field effect type LCD uses the nematic material which twisted the unenergized light passing through the cell. The nematic type material means the liquid crystals in which the molecules are arranged in a well-defined plane but not in a well-defined plane.

Q5. Define the Data logger operation with their block diagram. Also define the benefits of using a data logger.

Ans: Data logger are electronic devices which automatically monitor and record environmental parameters over time, allowing conditions to be measured, documented, analysed and validated. The data logger contain sensor to collect info and a computer chip to store it.

Benefits of data loggers:

- i) Data logging can be done manually by const. human observation.
- ii) Also can be done using electronic data logger is much effective, Accurate, reliable.

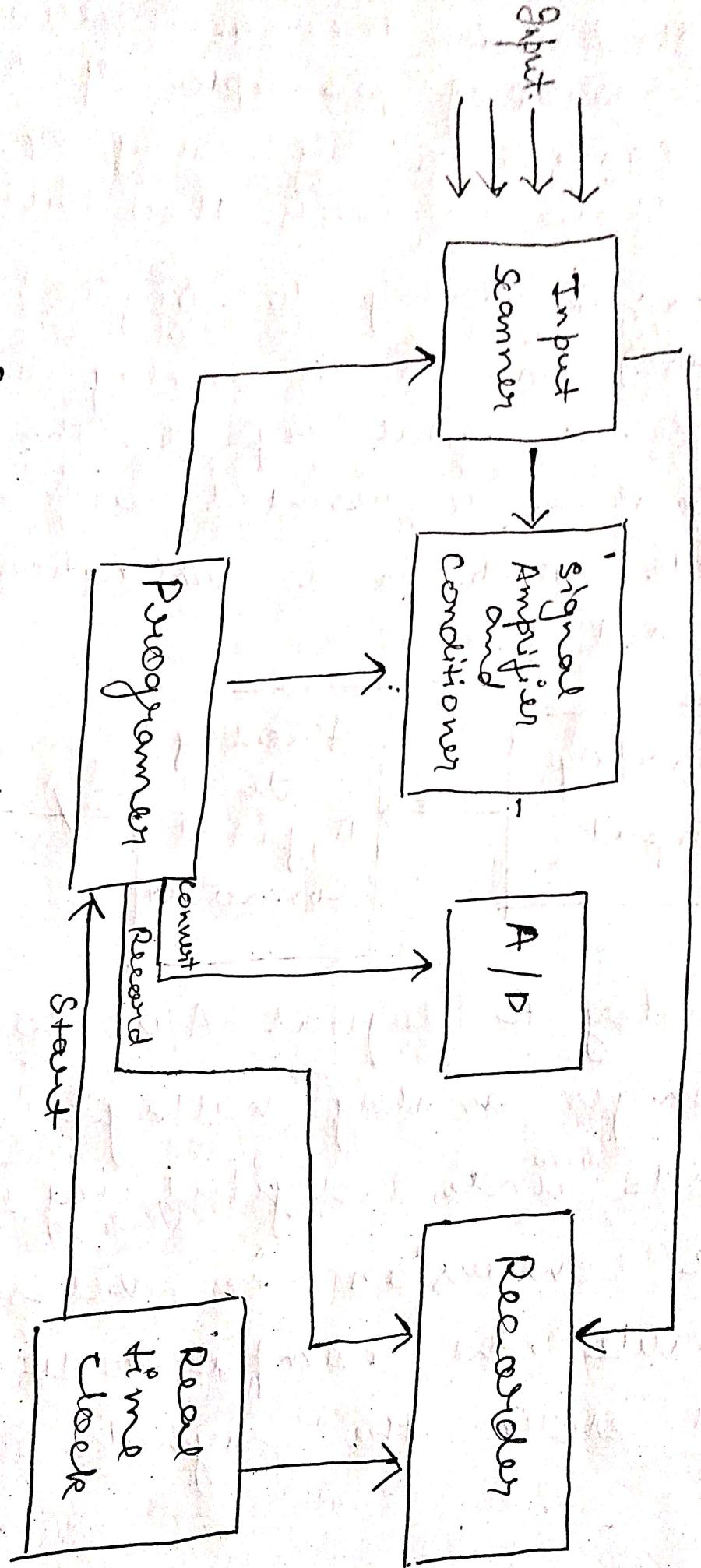
Time taken to see the benefits of using data loggers will depend on the way in which the unit are used. However quantifiable benefits from the using loggers may often be seen within a very short time.

Typically only one or two logging units are required to pinpoint areas that would benefit from extra attention.

Basic parts of Data loggers are :

Input scanner
Signal conditioner
A/D converter
Recording equipment
Programmer.

Block diagram of Data logger.

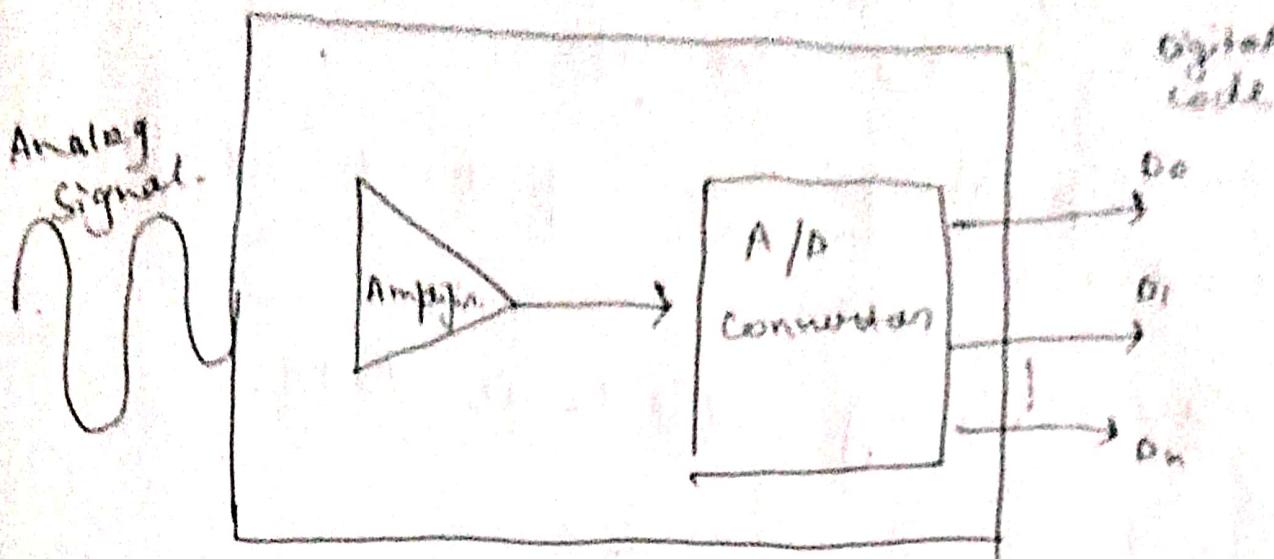


Q6. Explain the construction working principle of A/D converters by using Op-Amp Show it with their truth table

Ans: An Analog-to-Digital Converter (ADC) converts an analog signal into a digital signal. The digital signal is represented with a binary code, which is a combination of bits 0 and 1.



Analog to digital (A/D) conversion changes analog voltage or current levels into digital information. The conversion is necessary to enable the computer to process or store the signals.



Q7. Draw the block diagram of signal and multi-channel Data Acquisition sys. (DAS), and explain function of each stage of this sys. with truth table.

i) Single channel DAS.

- Direct conversion
- Pre-amplification and direct conversion.
- Sample and hold, and conversion
- Pre-amplification, signal conditioning and ampl. of the above.

ii) Multi-channel DAS

- Multiplexing the output single channel converters.

- Multiplexing the output of sample-and-hold circuits
- Multiplexing the input of sample-and-hold circuits.
- Multiplexing low level data.

Block Diagram of single channel DAS:

