SNS COLLEGE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II YEAR/III SEMESTER

COURSE NAME : 19ECT201 ELRCTRICAL ENGINEERING ANG INSTRUMENTATION

UNIT : 5 MEASURING INSTRUMENTS

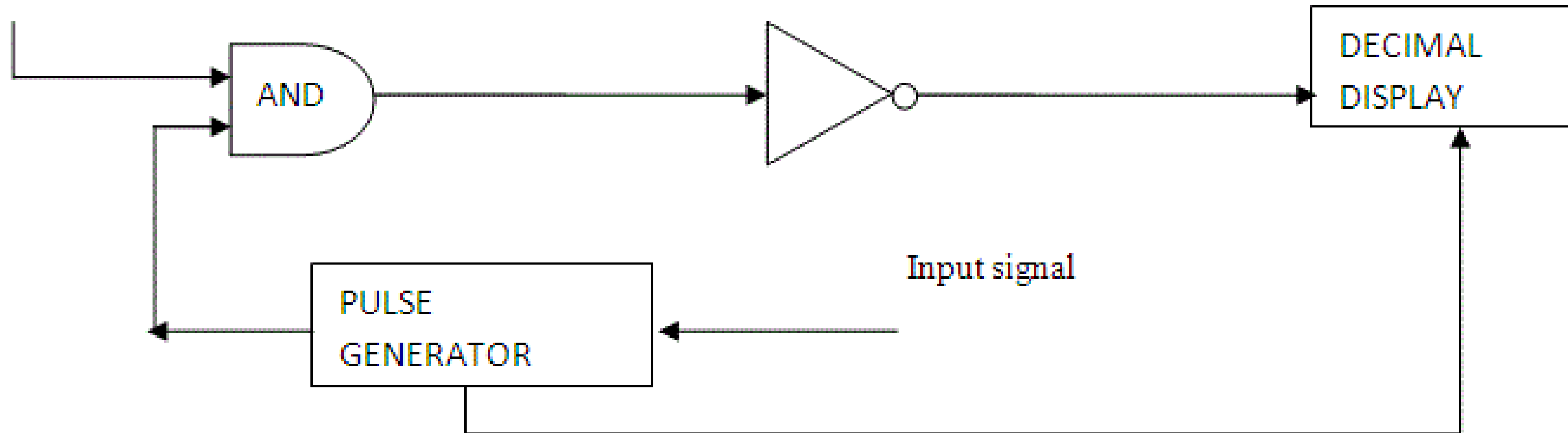TOPIC : DIGITAL VOLMETER (DVM)

INTRODUCTION

- A digital voltmeter (DVM) is an electronic instrument used to measure voltage in electrical circuits.

- It provides a numerical display of the voltage level in AC or DC, typically in volts, making it easier for users to read and interpret the measurement compared to analog voltmeters with needle indicators.

BLOCK DIAGRAM

WORKING PRINCIPLE

A digital voltmeter takes an analog voltage, converts it into a digital format, processes the digital signal, and then displays the voltage value on a screen

1. Signal Conditioning :

      The input voltage is conditioned to a suitable level for processing. This may involve amplification or attenuation

2. Analog-to-Digital Conversion (ADC) :

      The conditioned analog voltage is then converted into a digital signal using an ADC. The ADC breaks down the continuous voltage into discrete digital value

3. Microprocessor or Microcontroller :

        The digital signal is processed by a microprocessor or microcontroller, which might include functions like range selection, display control, and calibration

4. Display :

        The final digital value is displayed on the device's screen. Some DVMs may have additional features such as autoranging (automatically selecting the appropriate measurement range) and different measurement mode

5. Power Supply: DVMs are usually powered by batteries or an external power source

TYPES OF DVM

Digital Voltmeter is broadly classified into four types. They are,

- Ramp Type Digital Voltmeter

- Integrating Digital Voltmeter

- Continuous Balance Digital Voltmeter

- Successive approximation Digital Voltmeter

1.Integrating Digital Voltmeter (IDVM):

Integrates input voltage over time for accurate AC and DC measurements.

2. Ramp-Type Digital Voltmeter :

Converts input voltage into a frequency-related signal, measuring based on time-to-reach level.

3.Successive Approximation Digital Voltmeter (SADV):

Estimates input voltage by iterative approximations until achieving accuracy.

4.Dual-Slope Integrating Digital Voltmeter:

Measures voltage by integrating input in one direction, then discharging in the opposite direction for a specific time to determine output

APPLICATIONS OF DVM

• Digital Voltmeter is used to know the actual voltage of different components.

• DVM is widely used to check if there is power in the circuit, such as mains outlet.

• Knowing the voltage across a circuit, current can be calculated.

ADVANTAGES OF DVM

- Digital display of the output eliminates human reading errors.

- Readings are accurate and fast compared to analog meters.

- Digital Voltmeter is more stable and reliable.

- Smaller in size and cost-effective.

- DVM can measure both AC and DC voltages.

- DVM is void of Parallax errors.

- DVMs have automatic range selection.

- DVMs have high input impedance.

DISADVANTAGES OF DVM

- Digital Voltmeters are prone to damage if the voltage is increased beyond the limit.

- The display depends on the external power source or battery.

- When a fluctuation occurs in a circuit, the digital voltmeter cannot read and displays an error.

- Speed of operation is limited due to the digitizing circuit in digital voltmeters.