SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 23EET206 CONTROL SYSTEMS AND INSTRUMENTATION

II YEAR ECE /III SEMESTER

Unit 4- Electronic Instruments & Transducers

Topic 4 : Digital Multimeter

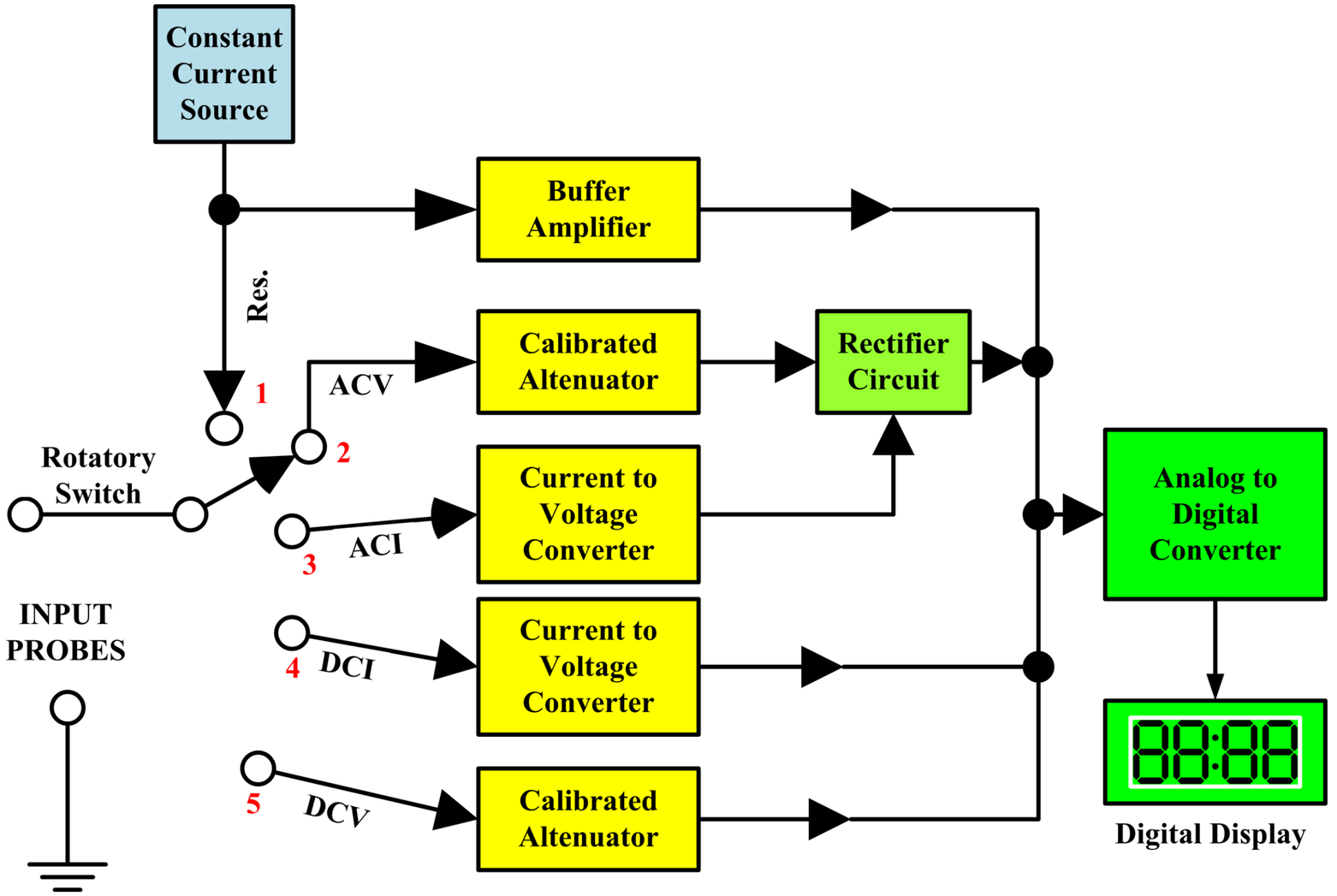
MULTIMETER

- A multimeter is device that can be used to measure multiple quantities.
- It measures quantities such as
  - DC Amperage & Voltage
  - AC Amperage & Voltage
  - Transistor Parameter
  - Resistance
  - Capacitance
  - Continuity Tester
- It can be classified as (i) Analog Multimeter (ii) Digital Multimeter

DIGITAL MULTIMETER

- A digital multimeter (DMM) is a multifunctional meter that displays its electrical quantitative values on an LCD screen.
- A digital multimeter much like an analog meter, it is able to read voltage, current, and resistance.

DIGITAL MULTIMETER



DIGITAL MULTIMETER

DIGITAL MULTIMETER

DMM Controls and Connection Ports

- A typical DMM has a rotary switch, digital display and connecting jacks for the probes.
- **Display** – The DMM has an illuminated display screen for better visualization. Most DMM have four digit display, the first of which can only be either a 0 or 1 and a + / - indication as well. There may also be some more indicators like AC / DC etc.
- **Connection Ports** – There are three or four ports available on the front of the DMM. However, only two are needed at a time. Typical ports of the DMM are
  - Common – It is used with all measurements. The negative (black) probe is connected to this.
  - VΩmA Port – This port is used for the most measurements and positive (red)probe is connected to it.
  - 10A Port – It is used to measure the large currents in the circuits.

DIGITAL MULTIMETER

- **Dial (Selection Knob)** – There is a rotary switch to select the types of measurement to be made and range that is needed.
- **Additional Connections** – There are some additional connections in DMM for other measurements like temperature, transistor gains etc.
- **Additional Buttons and switches** – There are a few additional buttons are present in a DMM. The main one is ON/OFF button.

DIGITAL MULTIMETER

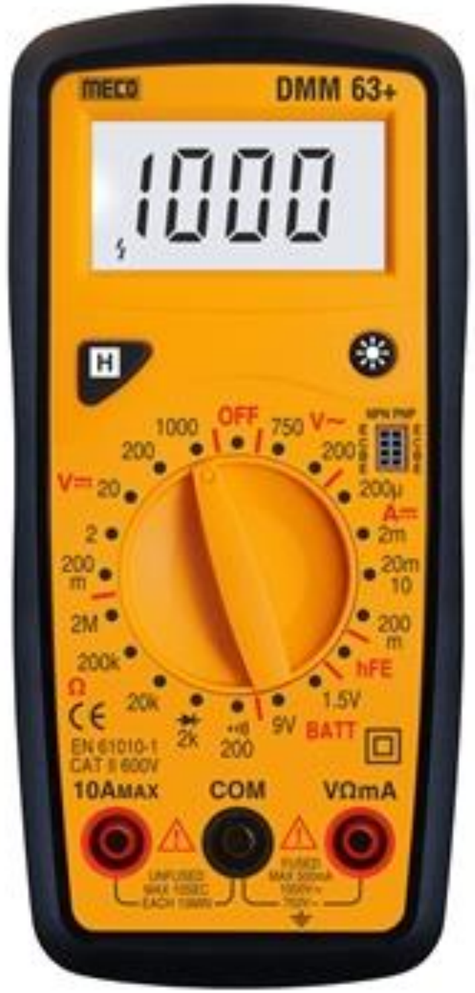
- **In AC Voltage Mode** – The applied input voltage is fed through a calibrated, compensated attenuator, to a full-wave rectifier followed by a ripple reduction filter. The resulting DC is fed to analog to digital converter (ADC) and finally to the display system.
- **In DC Current Mode** – The drop across an internal calibrated shunt is measured directly by the Analog to Digital Converter (ADC).
- **In AC Current Mode** – After AC to DC conversion, the drop across the internal calibrated shunt is measured by the ADC.
- **In the resistance range**, the Digital Multimeter operates by measuring the voltage across the externally connected resistor, resulting from a current flowing through it from a calibrated internal current source.

ADVANTAGES OF DIGITAL MULTIMETER

- They are having high input impendence, So there is no loading effect.
- They are having higher accuracy.
- An unambiguous reading is obtained.
- The output can be interfaced with external equipment.
- They are available in smaller sizes.
- It can be used for measurement of A.C. and D.C. both quantity.
- It can be used for measurement of various parameters such as resistance, voltage, current etc.
- It has sensitivity of 20 kΩ/V which is fairy high.
- Measurement of quantities with different range can be possible.
- It is small in size or compact.
- It is very simple to use unlike analog multimeter as results are displayed in numeric

SCALABLE DIGITAL MULTIMETER

Scalable Digital Multimeter: Manually Switched between the ranges to get the accurate reading. When working with the scalable digital multimeter, user need to have an idea of the value of voltage, current, or resistance that you are attempting to measure. Failure to observe these values will result in inaccurate readings and possible damage to the meter.



AUTO-RANGING DIGITAL MULTIMETER

- Switches between the ranges automatically for best reading.
- An auto-ranging multimeter checks and finds the correct range for you – it will automatically detect what you try to measure and show you the correct value!
- Auto-ranging multimeters might cost a bit more than their manual range counterparts, due to the extra chip and programming they need, in order to offer the additional capabilities.

AUTO-RANGING DIGITAL MULTIMETER

Advantages of Auto-ranging multimeters:

- These help save time.
- They automatically detect the electrical characteristics.
- They can automatically find the correct range of the detected electrical value.
- These make life easier for beginners, amateurs and hobbyists and save them stress of having to learn and become proficient in understanding electrical systems.
- These offer quick measurements when dealing with huge projects.

Having both auto-ranging and manual presets on the same device makes life easy for any user, helping him or her take fast measurements when needed as well as offer the option to manually select and measure when they need to.

References

1. Albert D. Helfrick, William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Pearson, 1st Edition, 2016 (Unit IV-V).
2. Sawhney A K., “Course in Electrical, Electronic Measurements and Instrumentation”, Shree Hari Publications, 2021(Unit IV-V).
3. Patranabis D, “Principles of Industrial Instrumentation”, Mc-Graw Hill Education, 3rd Edition, 2017 (Unit IV-V).

Thank You