

ICH302_ELECTRONIC INSTRUMENTS AND MEASUREMENT TECHNIQUE

Unit I

1. The PMMC instrument works on the principle of:

- A) Electromagnetic induction
- B) Force acting on a current-carrying conductor in a magnetic field
- C) Electrostatic attraction
- D) Heating effect

Answer: B) Force acting on a current-carrying conductor in a magnetic field

2. The permanent magnet in a PMMC instrument produces:

- A) Alternating magnetic field
- B) Uniform radial magnetic field
- C) Zero magnetic field
- D) Pulsating magnetic field

Answer: B) Uniform radial magnetic field

3. The controlling torque in a PMMC instrument is provided by:

- A) Permanent magnet
- B) Spiral springs
- C) Eddy current
- D) Air pressure

Answer: B) Spiral springs

4. The deflecting torque of a PMMC instrument is given by:

- A) $T_d = BINA$
- B) $T_d = B/I$
- C) $T_d = I/BNA$
- D) $T_d = BNA/I$

Answer: A) $T_d = BINA$

5. The scale of a PMMC instrument is:

- A) Non-uniform
- B) Uniform
- C) Logarithmic
- D) Exponential

Answer: B) Uniform

6. A PMMC instrument can directly measure:

- A) AC only
- B) DC only

- C) Both AC and DC
- D) High-frequency AC only

Answer: B) DC only

7. Moving iron instruments operate on the principle of:

- A) Chemical effect of current
- B) Magnetic effect of current
- C) Heating effect only
- D) Photoelectric effect

Answer: B) Magnetic effect of current

8. The two types of moving iron instruments are:

- A) PMMC and dynamometer
- B) Attraction and repulsion
- C) Induction and electrostatic
- D) Thermal and rectifier

Answer: B) Attraction and repulsion

9. A PMMC instrument is connected directly to a sinusoidal AC supply. The pointer does not give a steady meaningful reading because:

- A) Its resistance becomes infinite
- B) The torque reverses direction every half-cycle
- C) The spring becomes ineffective
- D) The permanent magnet loses magnetism

Answer: B) The torque reverses direction every half-cycle

10. In a repulsion-type moving iron instrument, the two iron pieces are:

- A) Magnetized with the same polarity
- B) Magnetized with opposite polarity
- C) Non-magnetic
- D) Permanently magnetized

Answer: A) Magnetized with the same polarity

11. Moving iron instruments can be used for:

- A) DC only
- B) AC only
- C) Both AC and DC
- D) High-frequency signals only

Answer: C) Both AC and DC

12. The scale of a moving iron instrument is generally:

- A) Uniform
- B) Non-uniform

- C) Completely linear
- D) Digital

Answer: B) Non-uniform

13. The resistance of an ideal ammeter is:

- A) Infinite
- B) Very high
- C) Zero
- D) Equal to load resistance

Answer: C) Zero

14. The range of an ammeter is extended by connecting a:

- A) High resistance in series
- B) Low resistance shunt in parallel
- C) Capacitor in series
- D) High resistance in parallel

Answer: B) Low resistance shunt in parallel

15. A shunt resistor connected to an ammeter carries:

- A) No current
- B) A major portion of the measured current
- C) The entire current always
- D) Only leakage current

Answer: B) A major portion of the measured current

16. A multi-range ammeter uses:

- A) Multiple series resistors
- B) Multiple shunt resistors
- C) Multiple capacitors
- D) Multiple inductors

Answer: B) Multiple shunt resistors

17. The purpose of a shunt in an ammeter is to:

- A) Increase the resistance of the meter
- B) Bypass a portion of the current around the meter movement
- C) Increase the voltage across the meter
- D) Reduce the supply frequency

Answer: B) Bypass a portion of the current around the meter movement

18. The range of a voltmeter is extended by connecting a:

- A) Low resistance in parallel
- B) High resistance in series
- C) Shunt resistance in parallel
- D) Capacitor in parallel

Answer: B) High resistance in series

19. A multi-range voltmeter is obtained by using:

- A) Different shunt resistors
- B) Different series resistors
- C) Different capacitors only
- D) Different inductors only

Answer: B) Different series resistors

20. A full-wave rectifier type AC voltmeter generally uses:

- A) PMMC movement with a rectifier
- B) Moving iron movement only
- C) Electrostatic movement
- D) Induction movement only

Answer: A) PMMC movement with a rectifier

21. A full-wave rectifier type AC voltmeter uses a PMMC movement. Its basic operating sequence is:

- A) AC → PMMC → Rectifier → Display
- B) AC → Rectifier → PMMC → Display
- C) DC → Rectifier → PMMC → AC
- D) AC → Transformer → PMMC only

Answer: B) AC → Rectifier → PMMC → Display

Analytical Reasoning

22. A PMMC instrument is connected directly to a 50 Hz AC supply. The pointer cannot provide a steady reading mainly because:

- A) The spring becomes permanently deformed
- B) The torque reverses direction every half-cycle
- C) The coil resistance becomes infinite
- D) The magnetic field becomes zero

Answer: B) The torque reverses direction every half-cycle

23. If the number of turns of the PMMC coil is doubled while current, magnetic flux density and coil area remain unchanged, the deflecting torque will:

- A) Become half
- B) Remain unchanged
- C) Become twice
- D) Become four times

Answer: C) Become twice

Reason: Since $T_d = BINA$, torque is directly proportional to the number of turns N .

24. A moving-iron instrument gives approximately the same deflection for +4 A DC and -4 A DC. This is because its deflecting torque depends mainly on:

- A) I
- B) I^2
- C) $1/I$
- D) Frequency

Answer: B) I^2

25. A student wants to extend the range of an ammeter but accidentally connects a high resistance in series with the meter. The most likely result is:

- A) The current range increases safely
- B) The meter becomes a voltmeter automatically
- C) The meter does not provide the intended range extension
- D) The shunt effect increases

Answer: C) The meter does not provide the intended range extension

26. A multi-range voltmeter uses different series resistors mainly because:

- A) Different voltage ranges require different total resistances
- B) Voltage increases when resistance decreases
- C) The meter movement requires AC
- D) Series resistors act as shunts

Answer: A) Different voltage ranges require different total resistances

27. If one diode in an ideal full-wave bridge rectifier becomes open-circuited, the circuit will most likely:

- A) Continue to use both half-cycles normally
- B) Behave like a half-wave rectifier
- C) Produce pure DC
- D) Double the output frequency

Answer: B) Behave like a half-wave rectifier

28. Statement: In a full-wave rectifier type AC voltmeter, only the positive half-cycle of the AC input is used for measurement.

- A) True
- B) False

Answer: B) False

Reason: A full-wave rectifier uses both positive and negative half-cycles of the AC input.

29. A 1 mA meter movement has an internal resistance of 100 Ω . To extend its range to 10 mA, the approximate shunt resistance is:

- A) 1.11 Ω
- B) 10 Ω
- C) 100 Ω
- D) 1000 Ω

Answer: A) 1.11 Ω

30. A PMMC movement has a full-scale current of 1 mA and resistance of 100 Ω . The series resistance required to convert it into a 10 V voltmeter is:

- A) 100 Ω
- B) 900 Ω
- C) 9.9 k Ω
- D) 10 k Ω

Answer: C) 9.9 k Ω

UNIT – II

1. The Wheatstone bridge is mainly used for measuring:

- A) Current
- B) Resistance
- C) Frequency
- D) Power

Answer: B) Resistance

2. A Wheatstone bridge consists of:

- A) Two arms
- B) Three arms
- C) Four arms
- D) Five arms

Answer: C) Four arms

3. At the balanced condition of a Wheatstone bridge, the current through the galvanometer is:

- A) Maximum
- B) Minimum but not zero
- C) Zero
- D) Equal to supply current

Answer: C) Zero

4. The balance equation of a Wheatstone bridge is:

- A) $P + Q = R + S$
- B) $P/Q = R/S$
- C) $P/R = S/Q$
- D) $P + R = Q + S$

Answer: B) $P/Q = R/S$

5. If $P = 100 \Omega$, $Q = 50 \Omega$, and $R = 200 \Omega$, the value of S for balance is:

- A) 25 Ω
- B) 50 Ω

C) 100 Ω

D) 400 Ω

Answer: D) 100 Ω

Note: The correct option is **C) 100 Ω** , not D.

6. The Kelvin double bridge is mainly used to measure:

A) High resistance

B) Low resistance

C) Capacitance

D) Frequency

Answer: B) Low resistance

7. The Kelvin double bridge is an extension of the:

A) Maxwell bridge

B) Wheatstone bridge

C) Schering bridge

D) Hay's bridge

Answer: B) Wheatstone bridge

8. The Kelvin double bridge eliminates the effect of:

A) Frequency

B) Lead and contact resistance

C) Capacitance

D) Inductance

Answer: B) Lead and contact resistance

9. An AC bridge is generally supplied with:

A) DC voltage

B) AC voltage

C) Constant current only

D) Pulsating DC only

Answer: B) AC voltage

10. The arms of an AC bridge may contain:

A) Only resistors

B) Resistors, inductors and capacitors

C) Only batteries

D) Only galvanometers

Answer: B) Resistors, inductors and capacitors

11. The general balance condition of an AC bridge is:

A) $Z_1 + Z_2 = Z_3 + Z_4$

B) $Z_1 Z_3 = Z_2 Z_4$

C) $Z_1/Z_2 = Z_3/Z_4$

D) $Z_1 = Z_2 = Z_3 = Z_4$

Answer: C) $Z_1/Z_2 = Z_3/Z_4$

12. In polar form, impedance is expressed as:

A) $Z = R + jX$

B) $Z = |Z| \angle \theta$

C) $Z = R - X$

D) $Z = R/X$

Answer: B) $Z = |Z| \angle \theta$

13. In rectangular form, impedance is represented as:

A) $Z = R + jX$

B) $Z = R/X$

C) $Z = R + X$

D) $Z = RX$

Answer: A) $Z = R + jX$

14. The real part of impedance in rectangular form represents:

A) Reactance

B) Resistance

C) Susceptance

D) Capacitance

Answer: B) Resistance

15. Maxwell's bridge is mainly used to measure:

A) Unknown resistance only

B) Unknown inductance

C) Unknown capacitance only

D) Frequency

Answer: B) Unknown inductance

16. Maxwell's bridge is generally suitable for measuring:

A) High-Q coils only

B) Medium-Q coils

C) Very low resistance

D) Very high capacitance

Answer: B) Medium-Q coils

17. One major advantage of Maxwell's bridge is that its balance is:

A) Highly dependent on frequency

B) Independent of frequency under ideal conditions

C) Dependent only on voltage

D) Impossible for AC measurements

Answer: B) Independent of frequency under ideal conditions

18. Hay's bridge is mainly used for measuring:

- A) Low-Q inductors
- B) High-Q inductors
- C) Low resistance
- D) High capacitance

Answer: B) High-Q inductors

19. Hay's bridge is a modification of the:

- A) Wheatstone bridge
- B) Maxwell bridge
- C) Kelvin bridge
- D) Schering bridge

Answer: B) Maxwell bridge

20. The Schering bridge is primarily used for measuring:

- A) Unknown resistance
- B) Unknown inductance
- C) Unknown capacitance and dielectric loss
- D) Current

Answer: C) Unknown capacitance and dielectric loss

21. The Schering bridge is widely used for testing:

- A) Electrical insulation and dielectric materials
- B) DC motors
- C) Batteries
- D) Ammeter shunts

Answer: A) Electrical insulation and dielectric materials

Analytical Reasoning

22. A Wheatstone bridge is balanced when the galvanometer shows zero deflection. This indicates that:

- A) No current flows through the entire bridge
- B) The potential difference across the galvanometer is zero
- C) The supply voltage is zero
- D) All four resistances are equal

Answer: B) The potential difference across the galvanometer is zero

23. If the galvanometer in a Wheatstone bridge shows a deflection toward one side, the best conclusion is:

- A) The bridge is perfectly balanced
- B) The ratio of the two pairs of arms is unequal

- C) The supply voltage is necessarily zero
- D) The unknown resistance is zero

Answer: B) The ratio of the two pairs of arms is unequal

24. A resistance of only a few milliohms is to be measured accurately. Which bridge would be the most appropriate?

- A) Wheatstone bridge
- B) Kelvin double bridge
- C) Maxwell bridge
- D) Schering bridge

Answer: B) Kelvin double bridge

25. An unknown coil has moderate quality factor and its inductance needs to be measured. Which bridge is generally suitable?

- A) Schering bridge
- B) Kelvin bridge
- C) Maxwell's bridge
- D) Wheatstone bridge

Answer: C) Maxwell's bridge

26. A student has two unknown inductors: Coil A has low Q and Coil B has high Q. Which selection is most appropriate?

- A) Maxwell's bridge for A and Hay's bridge for B
- B) Hay's bridge for A and Maxwell's bridge for B
- C) Kelvin bridge for both
- D) Schering bridge for both

Answer: A) Maxwell's bridge for A and Hay's bridge for B

27. An unknown capacitor is to be measured along with its dielectric loss. Which bridge is most appropriate?

- A) Wheatstone bridge
- B) Kelvin double bridge
- C) Maxwell's bridge
- D) Schering bridge

Answer: D) Schering bridge

28. A Wheatstone bridge has $P = 100\ \Omega$, $Q = 200\ \Omega$, and $R = 50\ \Omega$. For the bridge to be balanced, the unknown resistance S must be _____.

- A) $25\ \Omega$
- B) $50\ \Omega$
- C) $100\ \Omega$
- D) $200\ \Omega$

Answer: A) $100\ \Omega$

29. At balance, the galvanometer current in a Wheatstone bridge is zero because the potential difference across the galvanometer is zero.

- A) True
- B) False

Answer: A) True

30. A bridge circuit has impedances $Z_1 = 10 \Omega$, $Z_2 = 20 \Omega$, and $Z_3 = 30 \Omega$. For the bridge to be balanced, the value of Z_4 should be:

- A) 15Ω
- B) 30Ω
- C) 40Ω
- D) 60Ω

Answer: D) 60Ω

UNIT – III

1. The main function of a DC power supply is to convert:

- A) DC into AC
- B) AC into DC
- C) Mechanical energy into electrical energy
- D) DC into mechanical energy

Answer: B) AC into DC

2. The correct sequence of blocks in a basic DC power supply is:

- A) Rectifier → Transformer → Filter → Regulator
- B) Transformer → Rectifier → Filter → Regulator
- C) Filter → Transformer → Rectifier → Regulator
- D) Regulator → Filter → Rectifier → Transformer

Answer: B) Transformer → Rectifier → Filter → Regulator

3. The transformer in a DC power supply is mainly used to:

- A) Convert AC into DC
- B) Step up or step down AC voltage and provide isolation
- C) Remove ripple
- D) Regulate DC voltage

Answer: B) Step up or step down AC voltage and provide isolation

4. The main purpose of a filter in a DC power supply is to:

- A) Increase AC voltage
- B) Remove or reduce ripple from rectified output
- C) Convert DC into AC
- D) Increase frequency

Answer: B) Remove or reduce ripple from rectified output

5. A voltage regulator is used in a DC power supply to:

- A) Maintain a nearly constant output voltage
- B) Convert AC to pulsating DC
- C) Increase ripple
- D) Change DC into AC

Answer: A) Maintain a nearly constant output voltage

6. A variable DC power supply allows the user to:

- A) Adjust the output DC voltage over a specified range
- B) Remove the transformer
- C) Convert DC into AC
- D) Change resistance automatically

Answer: A) Adjust the output DC voltage over a specified range

7. A Megger is primarily used to measure:

- A) Low resistance
- B) Insulation resistance
- C) Capacitance
- D) Frequency

Answer: B) Insulation resistance

8. A Megger generally applies:

- A) Very low DC voltage
- B) High DC test voltage
- C) High-frequency AC voltage
- D) Zero voltage

Answer: B) High DC test voltage

9. If the insulation resistance of an electrical cable is very low, it indicates:

- A) Good insulation
- B) Poor insulation
- C) High efficiency
- D) Zero leakage current

Answer: B) Poor insulation

10. A Megger measures insulation resistance by measuring:

- A) Voltage only
- B) Current through the insulation under a known test voltage
- C) Frequency only
- D) Power factor only

Answer: B) Current through the insulation under a known test voltage

11. Instrument transformers are mainly used to:

- A) Increase the power rating of a circuit
- B) Measure high current and voltage safely
- C) Convert DC into AC
- D) Eliminate all electrical losses

Answer: B) Measure high current and voltage safely

12. The two main types of instrument transformers are:

- A) CT and PT
- B) PMMC and MI
- C) CRO and Megger
- D) Rectifier and filter

Answer: A) CT and PT

13. A Current Transformer (CT) is used to:

- A) Step down a large current to a smaller measurable current
- B) Step up a large current
- C) Convert AC into DC
- D) Measure insulation resistance

Answer: A) Step down a large current to a smaller measurable current

14. The secondary of a current transformer should never be:

- A) Connected to an ammeter
- B) Short-circuited
- C) Open-circuited while the primary is energized
- D) Connected to a protective relay

Answer: C) Open-circuited while the primary is energized

15. A Potential Transformer (PT) is used to:

- A) Step down high voltage to a lower measurable voltage
- B) Step up current
- C) Measure insulation resistance
- D) Convert AC into DC

Answer: A) Step down high voltage to a lower measurable voltage

16. CRO stands for:

- A) Cathode Ray Oscillator
- B) Cathode Ray Oscilloscope
- C) Current Reading Oscilloscope
- D) Cathode Resistance Oscillator

Answer: B) Cathode Ray Oscilloscope

17. The main function of a CRO is to:

- A) Measure and display electrical waveforms
- B) Measure insulation resistance

- C) Convert AC into DC
- D) Generate high voltage for transmission

Answer: A) Measure and display electrical waveforms

18. The major components of a CRO include:

- A) Vertical amplifier, horizontal amplifier, time-base generator and CRT
- B) Transformer and rectifier only
- C) CT and PT only
- D) Megger and galvanometer

Answer: A) Vertical amplifier, horizontal amplifier, time-base generator and CRT

19. The electron beam in a CRT is produced by the:

- A) Deflection plates
- B) Electron gun
- C) Phosphor screen
- D) Time-base generator

Answer: B) Electron gun

20. The function of the phosphor coating on the CRT screen is to:

- A) Generate electrons
- B) Produce visible light when struck by the electron beam
- C) Amplify the input signal
- D) Control the time base

Answer: B) Produce visible light when struck by the electron beam

21. A CRO can be used to measure:

- A) Voltage, frequency and phase difference
- B) Insulation resistance only
- C) Transformer oil level only
- D) Resistance only

Answer: A) Voltage, frequency and phase difference

Analytical Reasoning

22. A DC power supply has the blocks Transformer → Rectifier → Filter → Regulator. If the filter is removed, the output will most likely contain:

- A) No voltage
- B) Increased ripple
- C) Only AC
- D) Perfectly regulated DC

Answer: B) Increased ripple

23. A circuit requires a stable 12 V DC even though the input voltage and load current vary slightly. Which block is primarily responsible for maintaining the output voltage?

- A) Transformer
- B) Rectifier
- C) Filter
- D) Voltage regulator

Answer: D) Voltage regulator

24. A technician wants to check whether the insulation of a motor winding has deteriorated. Which instrument is most appropriate?

- A) Ammeter
- B) Voltmeter
- C) Megger
- D) Wattmeter

Answer: C) Megger

25. A power line carries a current of 500 A, but an ammeter can safely measure only 5 A. Which arrangement is most appropriate?

- A) Connect the ammeter directly to the line
- B) Use a CT with an appropriate transformation ratio
- C) Use a PT
- D) Connect a high resistance in series with the line

Answer: B) Use a CT with an appropriate transformation ratio

26. A PT has a ratio of 11000:110. If the primary voltage is 8800 V, the secondary voltage is approximately:

- A) 44 V
- B) 88 V
- C) 110 V
- D) 880 V

Answer: B) 88 V

27. A technician wants to determine the frequency, amplitude and time period of an unknown periodic signal. Which instrument is most suitable?

- A) Megger
- B) CT
- C) CRO
- D) PT

Answer: C) CRO

28. A DC power supply gives an unstable output voltage when the input AC voltage varies. Which section of the power supply is mainly responsible for correcting this variation?

- A) Transformer
- B) Rectifier

- C) Filter
- D) Voltage regulator

Answer: D) Voltage regulator

29. A technician wants to measure the insulation resistance of a long electrical cable without disconnecting the cable from its insulation testing arrangement. Which instrument is most appropriate?

- A) CRO
- B) Megger
- C) Potential Transformer
- D) Current Transformer

Answer: B) Megger

30. A high-voltage AC line must be measured using a voltmeter designed for a much lower voltage. Which arrangement is most suitable?

- A) Connect a CT in series with the voltmeter
- B) Connect a PT in parallel with the high-voltage line
- C) Connect a CT in parallel with the high-voltage line
- D) Connect a PT in series with the voltmeter

Answer: B) Connect a PT in parallel with the high-voltage line

UNIT – IV

1. An analog instrument generally represents a measured quantity using:

- A) Numerical digits
- B) Continuous pointer movement
- C) Binary code
- D) Computer memory

Answer: B) Continuous pointer movement

2. One major advantage of a digital instrument over an analog instrument is:

- A) Continuous pointer movement
- B) Easier reading with reduced parallax error
- C) Mechanical operation only
- D) No need for a power supply

Answer: B) Easier reading with reduced parallax error

3. A Schmitt trigger is mainly used to:

- A) Convert a slowly varying/noisy signal into a clean digital signal
- B) Amplify DC voltage only
- C) Measure resistance directly
- D) Store digital data

Answer: A) Convert a slowly varying/noisy signal into a clean digital signal

4. In an inverting Schmitt trigger, the output is:

- A) In phase with the input
- B) 180° out of phase with the input
- C) Always zero
- D) Always equal to the supply voltage

Answer: B) 180° out of phase with the input

5. The main feature of a Schmitt trigger is:

- A) Hysteresis
- B) Rectification
- C) Integration
- D) Differentiation

Answer: A) Hysteresis

6. A digital frequency meter measures frequency by determining the number of:

- A) Voltage levels
- B) Input pulses counted during a known time interval
- C) Resistance changes
- D) Stored waveforms

Answer: B) Input pulses counted during a known time interval

7. If a digital frequency meter counts 5000 pulses in 1 second, the measured frequency is:

- A) 500 Hz
- B) 1000 Hz
- C) 5000 Hz
- D) 10,000 Hz

Answer: C) 5000 Hz

8. In a digital frequency meter, the time-base circuit is mainly used to:

- A) Generate a known time interval for counting
- B) Amplify the input signal
- C) Store the measured frequency
- D) Convert AC into DC

Answer: A) Generate a known time interval for counting

9. Before counting pulses in a digital frequency meter, a Schmitt trigger is commonly used to:

- A) Produce a clean rectangular pulse from the input waveform
- B) Increase the measurement time
- C) Store the input waveform
- D) Reduce the supply voltage

Answer: A) Produce a clean rectangular pulse from the input waveform

10. If a frequency meter counts 2500 pulses during a gate time of 0.5 s, the frequency is:

- A) 1250 Hz
- B) 2500 Hz
- C) 5000 Hz
- D) 7500 Hz

Answer: C) 5000 Hz

11. In period measurement, the period of an unknown signal is determined by measuring the:

- A) Number of cycles in one second
- B) Number of reference clock pulses during one cycle
- C) Amplitude of the signal
- D) Resistance of the signal source

Answer: B) Number of reference clock pulses during one cycle

12. A signal has a frequency of 2 kHz. Its time period is:

- A) 0.5 ms
- B) 2 ms
- C) 5 ms
- D) 20 ms

Answer: A) 0.5 ms

13. For measuring very low frequencies accurately, period measurement is generally preferred because:

- A) The signal amplitude becomes larger
- B) A longer measurement interval can be obtained from one cycle
- C) The frequency becomes independent of time
- D) No reference clock is required

Answer: B) A longer measurement interval can be obtained from one cycle

14. A digital tachometer is primarily used to measure:

- A) Temperature
- B) Rotational speed
- C) Insulation resistance
- D) Capacitance

Answer: B) Rotational speed

15. The rotational speed measured by a digital tachometer is commonly expressed in:

- A) Volts
- B) Amperes
- C) RPM
- D) Hertz per second

Answer: C) RPM

16. A digital tachometer using a sensor that produces one pulse for every revolution measures speed by:

- A) Measuring the number of pulses per unit time
- B) Measuring resistance per revolution
- C) Measuring voltage only
- D) Measuring temperature variation

Answer: A) Measuring the number of pulses per unit time

17. The main advantage of a Digital Storage Oscilloscope (DSO) is its ability to:

- A) Store and recall waveforms
- B) Operate without any input signal
- C) Measure only DC signals
- D) Eliminate the need for sampling

Answer: A) Store and recall waveforms

18. In a DSO, the analog input signal is converted into digital data using a:

- A) DAC
- B) ADC
- C) Transformer
- D) Rectifier

Answer: B) ADC

19. A mixed storage oscilloscope combines the features of:

- A) Analog and digital storage techniques
- B) CT and PT
- C) AC and DC power supplies
- D) Frequency meter and tachometer only

Answer: A) Analog and digital storage techniques

20. A DSO is particularly useful for observing a waveform that occurs only once because it can:

- A) Store the captured waveform for later observation
- B) Continuously repeat the event automatically
- C) Convert the waveform into mechanical motion
- D) Eliminate the input signal

Answer: A) Store the captured waveform for later observation

21. A digital frequency meter is measuring a signal of 10 kHz using a gate time of 0.1 s. The number of pulses counted will be:

- A) 100
- B) 500
- C) 1000
- D) 10,000

Answer: C) 1000

Analytical Reasoning

22. An analog voltmeter pointer is between two scale markings, while a digital voltmeter displays 12.37 V directly. Which advantage of the digital instrument is most relevant here?

- A) It eliminates the need for a measuring circuit
- B) It reduces reading and interpolation errors
- C) It always has zero power consumption
- D) It can measure only DC quantities

Answer: B) It reduces reading and interpolation errors

23. A frequency meter counts 5000 pulses during a gate time of 1 second. The input frequency is:

- A) 500 Hz
- B) 1 kHz
- C) 5 kHz
- D) 10 kHz

Answer: C) 5 kHz

24. A periodic signal has a frequency of 2 kHz. Its time period is:

- A) 0.5 ms
- B) 2 ms
- C) 5 ms
- D) 20 ms

Answer: A) 0.5 ms

25. A digital tachometer produces 60 pulses per revolution. If the sensor produces 6000 pulses per minute, the rotational speed is:

- A) 10 RPM
- B) 60 RPM
- C) 100 RPM
- D) 600 RPM

Answer: C) 100 RPM

26. In a DSO, the input waveform is converted into digital samples and stored in memory. If the sampling rate is too low, the displayed waveform may:

- A) Become more accurate
- B) Suffer from aliasing or waveform distortion
- C) Automatically increase in amplitude
- D) Become a pure DC signal

Answer: B) Suffer from aliasing or waveform distortion

27. An engineer is debugging a microcontroller circuit and wants to observe both an analog sensor waveform and several digital logic signals at the same time. The most suitable instrument is:

- A) Megger
- B) Digital multimeter
- C) Mixed Signal Oscilloscope (MSO)
- D) Moving-iron instrument

Answer: C) Mixed Signal Oscilloscope (MSO)

28. A slowly varying noisy input signal is applied to a Schmitt trigger. What is the most likely output?

- A) A clean digital waveform
- B) A sinusoidal waveform with increased amplitude
- C) A constant DC voltage
- D) A random waveform

Answer: A) A clean digital waveform

29. A single transient waveform needs to be observed again after it has disappeared from the screen. Which instrument is most suitable?

- A) Analog oscilloscope
- B) Digital storage oscilloscope
- C) Digital tachometer
- D) Digital frequency meter

Answer: B) Digital storage oscilloscope

30. For measuring a very low-frequency signal, which method is generally more suitable and why?

- A) Frequency measurement, because more pulses are available
- B) Period measurement, because the time of one cycle can be measured accurately
- C) Frequency measurement, because no time base is required
- D) Period measurement, because signal amplitude increases

Answer: B) Period measurement, because the time of one cycle can be measured accurately

UNIT – V

1. A Digital Voltmeter (DVM) displays the measured voltage in:

- A) Pointer deflection
- B) Numerical form
- C) Mechanical displacement
- D) Analog waveform

Answer: B) Numerical form

2. The main function of an Analog-to-Digital Converter (ADC) in a DVM is to:

- A) Convert digital signals into analog signals
- B) Convert analog voltage into digital data

- C) Amplify the input voltage
- D) Generate AC voltage

Answer: B) Convert analog voltage into digital data

3. The major advantage of a digital voltmeter over an analog voltmeter is:

- A) Higher parallax error
- B) Easier reading and better accuracy
- C) Lower input impedance
- D) Continuous pointer movement

Answer: B) Easier reading and better accuracy

4. A linear ramp type DVM converts the unknown voltage into:

- A) Resistance
- B) A time interval
- C) Frequency only
- D) Capacitance

Answer: B) A time interval

5. In a linear ramp type voltmeter, the ramp voltage varies with time in a:

- A) Nonlinear manner
- B) Linear manner
- C) Sinusoidal manner
- D) Random manner

Answer: B) Linear manner

6. The unknown input voltage in a linear ramp DVM is determined by measuring the:

- A) Resistance of the input
- B) Time required for the ramp to reach the input voltage
- C) Frequency of the supply
- D) Current through the display

Answer: B) Time required for the ramp to reach the input voltage

7. A digital ramp voltmeter generally uses a:

- A) Ramp generator and counter
- B) Transformer and motor
- C) Schmitt trigger only
- D) Capacitor and inductor only

Answer: A) Ramp generator and counter

8. The successive approximation type DVM uses a:

- A) Successive approximation register
- B) Mechanical counter
- C) Moving coil
- D) Transformer only

Answer: A) Successive approximation register

9. The successive approximation method determines the digital value by:

- A) Testing bits from the highest significant bit downward
- B) Counting continuously from zero
- C) Measuring resistance directly
- D) Measuring frequency only

Answer: A) Testing bits from the highest significant bit downward

10. A comparator in a successive approximation DVM is used to:

- A) Compare the input voltage with the DAC output
- B) Measure current
- C) Generate clock pulses
- D) Drive the display directly

Answer: A) Compare the input voltage with the DAC output

11. A dual-slope DVM operates using:

- A) Two integration periods
- B) Two transformers
- C) Two oscillators only
- D) Two displays

Answer: A) Two integration periods

12. The first phase of a dual-slope ADC integrates the:

- A) Reference voltage
- B) Unknown input voltage
- C) Digital output
- D) Clock signal

Answer: B) Unknown input voltage

13. During the second phase of a dual-slope conversion, the integrator is connected to:

- A) A reference voltage of opposite polarity
- B) The unknown voltage again
- C) The display
- D) Ground only

Answer: A) A reference voltage of opposite polarity

14. A major advantage of a dual-slope DVM is its good rejection of:

- A) DC signals
- B) Power-line frequency noise
- C) All high-frequency signals
- D) Mechanical vibration

Answer: B) Power-line frequency noise

15. A Digital Multimeter (DMM) can commonly measure:

- A) Voltage, current and resistance
- B) Only voltage
- C) Only current
- D) Only frequency

Answer: A) Voltage, current and resistance

16. Auto-ranging in a DMM automatically:

- A) Changes the measurement range according to the input value
- B) Changes AC into DC
- C) Changes resistance into voltage
- D) Adjusts the battery voltage

Answer: A) Changes the measurement range according to the input value

17. Auto-zeroing in a DMM is used to:

- A) Compensate for internal offset errors
- B) Increase the supply voltage
- C) Change AC to DC
- D) Measure frequency

Answer: A) Compensate for internal offset errors

18. If the probes of a DMM are reversed while measuring DC voltage, auto-polarity will normally:

- A) Damage the meter
- B) Display a negative sign
- C) Display zero only
- D) Switch off the meter

Answer: B) Display a negative sign

19. A function generator is an electronic instrument used to:

- A) Generate different types of electrical waveforms
- B) Measure insulation resistance
- C) Measure only DC voltage
- D) Measure temperature

Answer: A) Generate different types of electrical waveforms

20. A typical function generator can produce:

- A) Sine, square and triangular waveforms
- B) Only sine waves
- C) Only DC voltage
- D) Only random noise

Answer: A) Sine, square and triangular waveforms

21. The amplitude control of a function generator determines the:

- A) Frequency of the output
- B) Magnitude of the output waveform
- C) Phase sequence only
- D) DC resistance

Answer: B) Magnitude of the output waveform

Analytical Reasoning

22. In a linear ramp type voltmeter, the ramp voltage increases uniformly with time. If the unknown input voltage is larger, the time required for the ramp to reach that voltage will:

- A) Decrease
- B) Increase
- C) Remain zero
- D) Become independent of voltage

Answer: B) Increase

23. A successive approximation voltmeter is preferred when rapid conversion is required because:

- A) It does not require comparison
- B) It determines the digital value through a limited number of successive decisions
- C) It uses mechanical movement
- D) It does not require a reference voltage

Answer: B) It determines the digital value through a limited number of successive decisions

24. A major reason dual-slope voltmeters are widely used in digital multimeters is their:

- A) Poor noise rejection
- B) Good noise rejection and accuracy
- C) Very low input resistance
- D) Mechanical operation

Answer: B) Good noise rejection and accuracy

25. A DMM is initially set to the 2 V range, but the measured voltage is 15 V. In an auto-ranging DMM, the instrument will:

- A) Automatically select a higher suitable range
- B) Always display zero
- C) Automatically convert the voltage into current
- D) Get damaged immediately

Answer: A) Automatically select a higher suitable range

26. A DMM shows 0.03 V even when its input terminals are shorted. Which feature helps compensate for this internal offset?

- A) Auto-ranging
- B) Auto-zeroing

- C) Auto-polarity
- D) Frequency selection

Answer: B) Auto-zeroing

27. A function generator is set to produce a 5 V peak-to-peak square wave. If the amplitude control is increased while frequency is kept constant, the most direct change will be:

- A) Frequency increases
- B) Frequency decreases
- C) Waveform amplitude increases
- D) Waveform becomes triangular automatically

Answer: C) Waveform amplitude increases

28. A DVM gives different readings when the same voltage is measured repeatedly, even though the input voltage is stable. Which feature would most directly help reduce this type of error?

- A) Auto-ranging
- B) Auto-zeroing
- C) Auto-polarity
- D) Function selection

Answer: B) Auto-zeroing

29. A DVM must measure an unknown voltage quickly without continuously counting from zero until the input value is reached. Which conversion method is most suitable?

- A) Linear ramp conversion
- B) Digital ramp conversion
- C) Successive approximation conversion
- D) Dual-slope conversion

Answer: C) Successive approximation conversion

30. A function generator is connected to an electronic circuit for testing. The technician changes the frequency while keeping the output voltage level unchanged. Which control is being adjusted?

- A) Amplitude control
- B) Frequency control
- C) DC offset control
- D) Output impedance control

Answer: B) Frequency control

Descriptive Questions

Unit I – Descriptive Questions

1. Explain the construction and working principle of a Permanent Magnet Moving Coil (PMMC) instrument with a neat diagram. Derive the torque equation.
2. Explain the construction and working of attraction-type and repulsion-type Moving Iron instruments with neat diagrams. Derive the expression for deflecting torque.
3. Explain the construction and working of multi-range ammeter and multi-range voltmeter with suitable diagrams.
4. Explain the construction and working of a full-wave rectifier type AC voltmeter with a neat circuit diagram.
5. Analytical Reasoning Question

Q. Answer all the following:

(a) True or False – 2 Marks

State whether the following statements are **True or False**.

- i. The deflecting torque of a PMMC instrument is directly proportional to the current flowing through its moving coil.
- ii. A moving-iron instrument can be used for measuring both AC and DC quantities.

(b) Match the Following – 2 Marks

Match **Column A** with the most appropriate item in **Column B**.

Column A	Column B
1. PMMC instrument	a. Low resistance connected in parallel
2. Moving-iron instrument	b. High resistance connected in series
3. Ammeter range extension	c. Uniform scale
4. Voltmeter range extension	d. Square-law deflection

Options:

- A) 1-c, 2-d, 3-a, 4-b
- B) 1-d, 2-c, 3-b, 4-a
- C) 1-c, 2-a, 3-d, 4-b
- D) 1-b, 2-d, 3-a, 4-c

(c) Assertion and Reason – 2 Marks

Assertion (A): A shunt resistance is connected in parallel with the meter movement to extend the range of an ammeter.

Reason (R): The shunt provides a low-resistance path for most of the current, allowing only the rated current to pass through the meter movement.

- A) Both A and R are true, and R is the correct explanation of A
- B) Both A and R are true, but R is not the correct explanation of A
- C) A is true, but R is false
- D) A is false, but R is true

(d) Identify the Device – 2 Marks

Identify the instrument based on the following clues:

It uses a permanent magnet and a moving coil, has a uniform scale, is mainly suitable for DC measurements, and its deflecting torque is proportional to current.

- A) Moving-Iron instrument
- B) PMMC instrument
- C) Full-wave rectifier type AC voltmeter
- D) Electrodynamometer instrument

Answer: _____

(e) Arrange the Steps in Correct Order – 2 Marks

A student wants to **extend the range of a PMMC meter to convert it into a voltmeter**. Arrange the following steps in the correct sequence:

1. Connect the calculated high-value resistance in series with the meter movement.
2. Determine the full-scale deflection current (I_m) and internal resistance (R_m).
3. Select the required voltage range (V).
4. Calculate the series resistance using
 $R_s = (V/I_m) - R_m$
5. Connect the extended-range voltmeter across the circuit under measurement.

Choose the correct sequence:

- A) 2 → 3 → 4 → 1 → 5
- B) 3 → 2 → 1 → 4 → 5
- C) 2 → 4 → 3 → 1 → 5
- D) 3 → 4 → 2 → 1 → 5

Answer: _____

Unit II – Descriptive Questions

1. Explain the construction and working of a Wheatstone bridge with a neat circuit diagram. Derive the balance equation and explain how the bridge is used to measure an unknown resistance.
2. Explain the construction and working of a Kelvin double bridge with a neat circuit diagram. Derive the balance equation and explain how it is used for the measurement of low resistance.
3. Explain the construction and working of Maxwell's bridge. state their applications.
4. Explain the construction and working of a Schering bridge with a neat circuit diagram. Derive the balance equations and explain how the bridge is used to measure an unknown capacitance and dielectric loss.
5. Analytical Reasoning Question

Q. Answer all the following:

(a) True or False – 2 Marks

State whether the following statements are **True or False**.

- i. A Wheatstone bridge is balanced when the potential difference across the galvanometer is zero.
- ii. Kelvin double bridge is preferred for measuring very high resistance because the effect of lead and contact resistance becomes negligible.

(b) Match the Following – 2 Marks

Match **Column A** with the most appropriate item in **Column B**.

Column A	Column B
1. Wheatstone bridge	a. High-Q inductance
2. Kelvin double bridge	b. Unknown capacitance and dielectric loss
3. Hay's bridge	c. Medium resistance
4. Schering bridge	d. Very low resistance

Options:

- A) 1-c, 2-d, 3-a, 4-b
- B) 1-d, 2-c, 3-b, 4-a
- C) 1-c, 2-a, 3-d, 4-b
- D) 1-b, 2-d, 3-a, 4-c

(c) Assertion and Reason – 2 Marks

Assertion (A): Kelvin double bridge is suitable for measuring very low resistance.

Reason (R): The Kelvin double bridge arrangement minimizes the effect of connecting-lead and contact resistances.

- A) Both A and R are true, and R is the correct explanation of A
- B) Both A and R are true, but R is not the correct explanation of A
- C) A is true, but R is false
- D) A is false, but R is true

(d) Identify the Device/Bridge – 2 Marks

Identify the bridge based on the following clues:

It is an AC bridge used for measuring an unknown capacitance and dielectric loss. It compares the unknown capacitor with a standard capacitor and uses a balance condition to determine the unknown parameters.

- A) Wheatstone bridge
- B) Kelvin double bridge
- C) Schering bridge
- D) Hay's bridge

Answer: _____

(e) Arrange the Steps in Correct Order – 2 Marks

A student wants to **measure an unknown resistance using a Wheatstone bridge**. Arrange the following steps in the correct sequence:

1. Adjust the variable resistance until the galvanometer shows zero deflection.
2. Connect the unknown resistance in one arm of the bridge.
3. Apply the DC supply to the bridge circuit.
4. Note the known resistance values and the balance condition.
5. Calculate the unknown resistance using the balance equation.

Choose the correct sequence:

- A) 2 → 3 → 1 → 4 → 5
- B) 3 → 2 → 1 → 5 → 4
- C) 2 → 1 → 3 → 4 → 5
- D) 3 → 1 → 2 → 4 → 5

Answer: _____

Unit III – Descriptive Questions

1. Draw and explain the block diagram and working of a DC power supply and state their applications.
2. Explain the construction and working principle of a Megger with a neat diagram and state its important applications.
3. Explain the construction and working of Current Transformer (CT) and Potential Transformer (PT) with neat diagrams.
4. Draw the block diagram of a CRO and explain its working. List and explain the important applications of CRO.
5. Analytical Reasoning Question

Q. Answer all the following:

(a) True or False – 2 Marks

State whether the following statements are **True or False**.

- i. A voltage regulator in a DC power supply is used to maintain a nearly constant output voltage when the input voltage or load changes.
- ii. A Megger is primarily used to measure the low resistance of electrical conductors.

(b) Match the Following – 2 Marks

Column A	Column B
1. Transformer	a. Measures insulation resistance
2. Rectifier	b. Converts AC into pulsating DC
3. Megger	c. Changes AC voltage level
4. Voltage regulator	d. Maintains constant DC output

Options:

- A) 1-c, 2-b, 3-a, 4-d
- B) 1-b, 2-c, 3-d, 4-a
- C) 1-c, 2-a, 3-b, 4-d
- D) 1-d, 2-b, 3-a, 4-c

(c) Assertion and Reason – 2 Marks

Assertion (A): The secondary of a Current Transformer (CT) should not normally be open-circuited while its primary is carrying current.

Reason (R): A dangerously high voltage may develop across the open secondary of an energized CT.

- A) Both A and R are true, and R is the correct explanation of A
- B) Both A and R are true, but R is not the correct explanation of A
- C) A is true, but R is false
- D) A is false, but R is true

(d) Identify the Device – 2 Marks

Identify the device based on the following clues:

It is used with a high-voltage AC system to reduce the voltage to a safer, measurable value for meters and protective relays. Its primary is connected across the high-voltage supply.

- A) Current Transformer (CT)
- B) Potential Transformer (PT)
- C) Megger
- D) Rectifier

Answer: _____

(e) Arrange the Steps in Correct Order – 2 Marks

A DC power supply is used to obtain a regulated DC output from an AC input. Arrange the following steps in the correct sequence:

1. The filter reduces the AC ripple present in the rectified output.
2. The transformer changes the AC voltage to the required level.
3. The regulator maintains the required DC output voltage.
4. The rectifier converts AC into pulsating DC.

Choose the correct sequence:

- A) 2 → 4 → 1 → 3
- B) 4 → 2 → 1 → 3
- C) 2 → 1 → 4 → 3
- D) 1 → 2 → 4 → 3

Answer: _____

Unit IV – Descriptive Questions

1. Differentiate between analog and digital. Explain the construction and working of inverting and non-inverting Schmitt trigger circuits with neat circuit diagrams.
2. Draw the block diagram and explain the working of a digital frequency meter.
3. Explain the construction and working principle of a digital tachometer with a neat block diagram.
4. Explain the construction, working and principle of a Digital Storage Oscilloscope (DSO) and a Mixed Signal/Storage Oscilloscope.
5. Analytical Reasoning Question

Q. Answer all the following:

(a) True or False – 2 Marks

State whether the following statements are **True or False**.

- i. A digital instrument generally provides a direct numerical display, reducing parallax and reading errors.
- ii. A Schmitt trigger uses hysteresis to reduce the effect of noise near the switching threshold.

(b) Match the Following – 2 Marks

Column A	Column B
1. Digital frequency meter	a. Measures rotational speed
2. Schmitt trigger	b. Captures and stores waveforms
3. Digital tachometer	c. Measures frequency by counting pulses
4. Digital Storage Oscilloscope	d. Provides hysteresis

Options:

- A) 1-c, 2-d, 3-a, 4-b
- B) 1-d, 2-c, 3-b, 4-a
- C) 1-c, 2-a, 3-d, 4-b
- D) 1-b, 2-d, 3-a, 4-c

(c) Assertion and Reason – 2 Marks

Assertion (A): A Schmitt trigger is useful for converting a slowly varying or noisy input signal into a clean digital output.

Reason (R): The Schmitt trigger has two different switching threshold levels, which provides hysteresis and prevents unwanted multiple switching due to small noise variations.

- A) Both A and R are true, and R is the correct explanation of A
- B) Both A and R are true, but R is not the correct explanation of A
- C) A is true, but R is false
- D) A is false, but R is true

(d) Identify the Device – 2 Marks

Identify the instrument based on the following clues:

It receives pulses from a rotating shaft, counts the pulses over a known time interval and displays the rotational speed directly in revolutions per minute (RPM).

- A) Digital frequency meter
- B) Digital tachometer
- C) Digital storage oscilloscope
- D) Schmitt trigger

Answer: _____

(e) Arrange the Steps in Correct Order – 2 Marks

A digital frequency meter is used to measure the frequency of an unknown periodic signal. Arrange the following steps in the correct sequence:

1. Count the number of input pulses during the gate interval.
2. Apply the unknown signal to the input conditioning circuit.
3. Display the calculated frequency.
4. Open the gate for a precisely known time interval.
5. Calculate frequency using ($f=N/T$).

Choose the correct sequence:

- A) 2 → 4 → 1 → 5 → 3
- B) 4 → 2 → 1 → 5 → 3
- C) 2 → 1 → 4 → 5 → 3
- D) 1 → 2 → 4 → 3 → 5

Answer: _____

Unit V – Descriptive Questions

1. Explain the construction and working of a linear ramp type Digital Voltmeter with neat block diagrams.
2. Draw and explain the block diagram and working of a dual-slope digital voltmeter. State its advantages and applications.
3. Explain the block diagram and working of a Digital Multimeter (DMM). Describe the functions of auto-ranging, auto-zeroing and auto-polarity.
4. Draw the block diagram of a function generator and explain its working principle. State the applications of a function generator.
5. Analytical Reasoning Question

Q. Answer all the following:

(a) True or False – 2 Marks

State whether the following statements are **True or False**. Give a brief justification.

- i. In a dual-slope digital voltmeter, the time required for deintegration is proportional to the magnitude of the unknown input voltage.
- ii. Auto-zeroing in a digital multimeter helps to compensate for internal offset errors before the actual measurement is displayed.

(b) Match the Following – 2 Marks

Column A	Column B
1. Linear ramp voltmeter	a. Automatic correction of input polarity
2. Successive approximation voltmeter	b. Measures voltage by successive bit decisions
3. Auto-zeroing	c. Voltage measured from ramp crossing time
4. Auto-polarity	d. Compensates for internal offset

Options:

- A) 1-c, 2-b, 3-d, 4-a
- B) 1-b, 2-c, 3-a, 4-d
- C) 1-c, 2-d, 3-b, 4-a
- D) 1-a, 2-b, 3-d, 4-c

(c) Assertion and Reason – 2 Marks

Assertion (A): A dual-slope voltmeter provides good accuracy in the presence of power-line noise.

Reason (R): The integration process can average out periodic noise components, particularly when the integration period is suitably selected.

- A) Both A and R are true, and R is the correct explanation of A
- B) Both A and R are true, but R is not the correct explanation of A
- C) A is true, but R is false
- D) A is false, but R is true

(d) Identify the Device – 2 Marks

Identify the instrument based on the following clues:

It compares the unknown input voltage with a reference voltage by making a series of decisions, starting with the most significant bit, until the closest digital value is obtained.

- A) Linear ramp voltmeter
- B) Digital ramp voltmeter
- C) Successive approximation voltmeter
- D) Dual-slope voltmeter

Answer: _____

(e) Arrange the Steps in Correct Order – 2 Marks

A **dual-slope digital voltmeter** is used to measure an unknown DC voltage. Arrange the following steps in the correct sequence:

1. Apply a reference voltage of opposite polarity to the integrator.
2. Integrate the unknown input voltage for a fixed time.
3. Count the clock pulses during the deintegration period.
4. Detect when the integrator output returns to zero.
5. Display the measured voltage based on the counted pulses.

Choose the correct sequence:

- A) 2 → 1 → 4 → 3 → 5
- B) 1 → 2 → 4 → 3 → 5
- C) 2 → 4 → 1 → 3 → 5
- D) 1 → 3 → 2 → 4 → 5

Answer: _____