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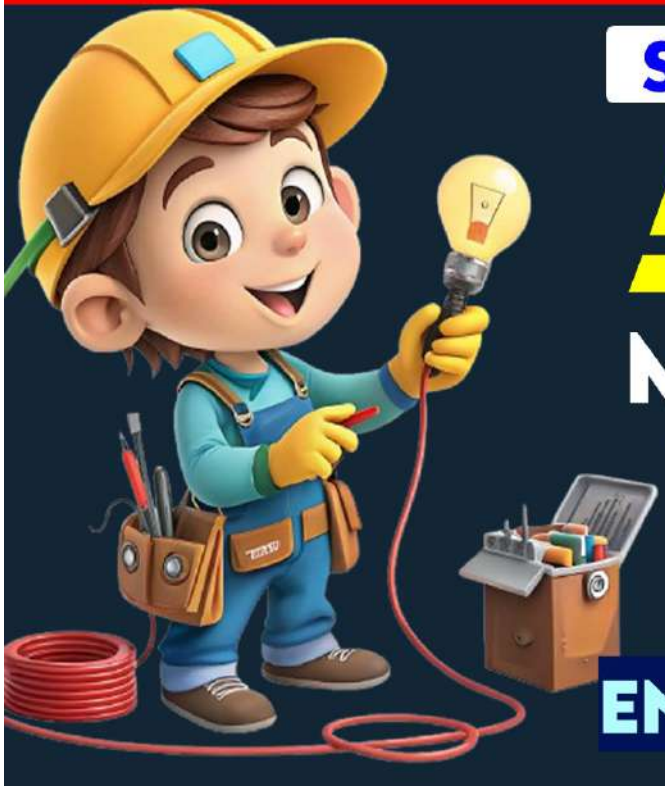

SYLLABUS TOPIC WISE

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MCQ QUESTIONS WITH ANSWER EXPLANATION

ENGLISH MEDIUM ONLY

TECHNICAL ASSISTANT (...

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Unit 1: Circuit Theory and DC Machines

Electrostatics

1. Electric field intensity due to a point charge is:

A) Inversely proportional to r

B) Inversely proportional to r^2

C) Directly proportional to r

D) Constant

2. The unit of permittivity (ε) is:

A) F/m

B) C/m^2

C) V/m

D) J/m

3. Which of the following statement is wrong?

A) Electric field is a vector

B) Electric potential is scalar

C) Electric field inside a conductor is maximum

D) Electric flux density is D = εE

4. Formula for Capacitance of a parallel plate capacitor:

A) C = A/d

B) C = εA/d

C) C = εd/A

D) $C = q/V^2$

5. Electric potential at a point is:

A) Work done per unit mass

B) Work done per unit charge

C) Force per unit mass

D) Force per unit charge

6. Which of the following has the highest dielectric constant?

A) Air

B) Water

C) Glass

D) Mica

7. In Coulomb's Law, the assumption is:

A) Charges are moving

B) Charges are on surface

C) Charges are point and stationary

D) Charges are in dielectric

8. Gauss's law states that:

A) Electric flux is independent of charge

B) Electric field is inversely proportional to area

C) Total flux = Enclosed charge / ε_0

D) E = V/d

9. If two equal and opposite charges are placed a small distance apart, it forms a:

A) Conductor

B) Capacitor

C) Dipole

D) Monopole

10. Which of the following statement is correct about equipotential surfaces?

A) Work is required to move charge

B) Are parallel to electric field lines

C) Are perpendicular to electric field lines

D) Always spherical

11. Electric flux density (D) is defined as:

A) $D = q/A$

B) $D = qE$

C) $D = E/\varepsilon$

D) $D = \varepsilon E$

12. Capacitance depends on:

A) Material only

B) Geometry and dielectric

C) Charge only

D) Voltage only

13. Work done in moving a charge in equipotential surface is:

A) Maximum

B) Depends on charge

C) Zero

D) Infinite

14. Match the following:

List I	List II
A. Potential	1. Scalar
B. Electric field	2. Vector
C. Capacitance	3. Farad
D. Permittivity	4. F/m

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

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

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

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

15. Energy stored in a capacitor is:

A) ½ CV^2

B) CV

C) V^2/C

D) qV

16. Electric field is the negative gradient of:

A) Current

B) Potential

C) Resistance

D) Capacitance

17. The electric field between the plates of a parallel plate capacitor is:

A) Constant

B) Zero

C) Varies with r^2

D) Infinite

18. Unit of electric flux is:

A) N

B) Nm^2

C) C

D) V/m

19. Which of the following affects the capacitance of a capacitor?

A) Temperature

B) Resistance

C) Area and distance

D) Voltage applied

20. Which of the following is not a characteristic of electrostatics?

A) Charges are at rest

B) Electric field is time-varying

C) No current flow

D) Force exists between charges

Unit 1: Circuit Theory and DC Machines

Electrostatics

1. Electric field intensity due to a point charge is:

A) Inversely proportional to r

B) Inversely proportional to r^2

C) Directly proportional to r

D) Constant

Explanation: $E = (1/4\pi\varepsilon_0) * q / r^2$

2. The unit of permittivity (ε) is:

A) F/m

B) C/m^2

C) V/m

D) J/m

Explanation: ε = Farad per meter (F/m), from C = εA/d

3. Which of the following statement is wrong?

A) Electric field is a vector

B) Electric potential is scalar

C) Electric field inside a conductor is maximum

D) Electric flux density is D = εE

Explanation: Electric field inside a conductor is zero in electrostatics.

4. Formula for Capacitance of a parallel plate capacitor:

A) C = A/d

B) C = εA/d

C) C = εd/A

D) C = q/V²

5. Electric potential at a point is:

A) Work done per unit mass

B) Work done per unit charge

C) Force per unit mass

D) Force per unit charge

Explanation: V = W/q

6. Which of the following has the highest dielectric constant?

A) Air

B) Water

C) Glass

D) Mica

Explanation: Water has εr ≈ 80, much higher than others.

7. In Coulomb's Law, the assumption is:

A) Charges are moving

B) Charges are on surface

C) Charges are point and stationary

D) Charges are in dielectric

Explanation: Coulomb's law is valid for point, stationary charges.

8. Gauss's law states that:

A) Electric flux is independent of charge

B) Electric field is inversely proportional to area

C) Total flux = Enclosed charge / ε_0

D) E = V/d

Explanation: Φ = q_enclosed / ε_0

9. If two equal and opposite charges are placed a small distance apart, it forms a:

A) Conductor

B) Capacitor

C) Dipole

D) Monopole

Explanation: An electric dipole consists of +q and -q separated by distance.

10. Which of the following statement is correct about equipotential surfaces?

A) Work is required to move charge

B) Are parallel to electric field lines

C) Are perpendicular to electric field lines

D) Always spherical

Explanation: No work done → surface must be perpendicular to field.

11. Electric flux density (D) is defined as:

A) D = q/A

B) D = qE

C) D = E/ε

D) D = εE

Explanation: D = εE is standard relation in electrostatics.

12. Capacitance depends on:

A) Material only

B) Geometry and dielectric

C) Charge only

D) Voltage only

Explanation: C ∝ ε and area, inversely ∝ distance

13. Work done in moving a charge in equipotential surface is:

A) Maximum

B) Depends on charge

C) Zero

D) Infinite

Explanation: No potential difference → No work

14. Match the following:

List I	List II
A. Potential	1. Scalar
B. Electric field	2. Vector
C. Capacitance	3. Farad
D. Permittivity	4. F/m

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

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

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

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

15. Energy stored in a capacitor is:

A) ½ CV²

B) CV

C) V²/C

D) qV

Explanation: Energy U = ½ CV²

16. Electric field is the negative gradient of:

A) Current

B) Potential

C) Resistance

D) Capacitance

Explanation: E = -dV/dx

17. The electric field between the plates of a parallel plate capacitor is:

A) Constant

B) Zero

C) Varies with r²

D) Infinite

Explanation: Uniform field: E = V/d

18. Unit of electric flux is:

A) N

B) Nm²

C) C

D) V/m

Explanation: Φ = E·A → unit = C (Coulombs)

19. Which of the following affects the capacitance of a capacitor?

A) Temperature

B) Resistance

C) Area and distance

D) Voltage applied

Explanation: C = εA/d

20. Which of the following is not a characteristic of electrostatics?

A) Charges are at rest

B) Electric field is time-varying

C) No current flow

D) Force exists between charges

Explanation: Time-varying field is part of electrodynamics, not electrostatics.

Unit 2: AC Machines

Single Phase Transformer

1. A transformer works on the principle of:

A) Electrostatic induction

B) Electromagnetic induction

C) Self-induction

D) Mutual capacitance

2. The unit of transformer efficiency is:

A) Ohm

B) Volt

C) Percent

D) Watt

3. The EMF equation of a transformer is:

A) $E = 2\pi fN\phi$

B) $E = 4.44fN\phi$

C) $E = I^2R$

D) $E = V + IR$

4. In an ideal transformer, core loss is:

A) Very high

B) Zero

C) Negligible but not zero

D) Infinite

5. The no-load current in a transformer is:

A) In phase with voltage

B) Lagging the voltage

C) Leading the voltage

D) Opposite to voltage

6. The leakage flux in a transformer is:

A) Helpful in energy transfer

B) Confined to core only

C) Lost and does not link both windings

D) Equal to main flux

7. Which of the following statement is wrong for an ideal transformer?

A) No copper loss

B) Zero core loss

C) Perfect magnetic coupling

D) Secondary current leads primary current

8. Which assumption is made in the transformer EMF equation derivation?

A) Non-sinusoidal waveform

B) Uniform magnetic flux

C) Leakage flux is dominant

D) No magnetization required

9. What is the condition for maximum efficiency in a transformer?

A) Iron loss = Copper loss

B) Iron loss > Copper loss

C) Copper loss = 0

D) Total loss is minimum

10. In the OC test of a transformer, the voltmeter is connected across:

A) High-voltage side

B) Low-voltage side

C) Across core

D) Across load

11. The purpose of laminating the core in a transformer is:

A) To increase eddy current loss

B) To reduce hysteresis loss

C) To reduce eddy current loss

D) To improve magnetic coupling

12. The efficiency of a transformer is maximum when:

A) It is under full load

B) It is under no-load

C) Iron loss equals copper loss

D) Copper loss is more than iron loss

13. Which of the following is a unit of magnetic flux?

A) Tesla

B) Henry

C) Weber

D) Ohm

14. In a transformer, if the primary turns are more than secondary, it is called:

A) Step-up transformer

B) Auto transformer

C) Step-down transformer

D) Isolation transformer

15. Core losses in a transformer depend on:

A) Load current

B) Supply voltage and frequency

C) Temperature

D) Load power factor

16. The EMF equation E = 4.44 f N Φ assumes:

A) Pure resistive load

B) Square waveform

C) Sinusoidal waveform

D) Constant voltage

17. Which of the following is not associated with transformer testing?

A) Open Circuit Test

B) Short Circuit Test

C) Back-to-Back Test

D) Load Flow Test

18. The transformer oil is used for:

A) Cooling and lubrication

B) Cooling and insulation

C) Increasing core efficiency

D) Preventing eddy current

19. Which of the following affects the regulation of a transformer?

A) Load power factor

B) Core material

C) Ambient temperature

D) No-load current

20. Which of the following is true about an ideal transformer?

A) Has leakage flux

B) Has copper loss

C) Has 100% efficiency

D) Core loss is maximum

Unit 2: AC Machines

Single Phase Transformer

1. A transformer works on the principle of:

A) Electrostatic induction

B) Electromagnetic induction

C) Self-induction

D) Mutual capacitance

Explanation:

A) Incorrect – Electrostatic induction is not used in transformers.

B) Correct – Transformer operates on mutual electromagnetic induction between primary and secondary windings.

C) Incorrect – Self-induction applies to inductors, not transformers.

D) Incorrect – Transformers do not work on capacitance.

2. The unit of transformer efficiency is:

A) Ohm

B) Volt

C) Percent

D) Watt

Explanation:

A) Incorrect – Ohm is unit of resistance.

B) Incorrect – Volt is unit of voltage.

C) Correct – Efficiency is a ratio, typically expressed in percentage.

D) Incorrect – Watt is power unit, not efficiency.

3. The EMF equation of a transformer is:

A) E = 2πfNϕ

B) E = 4.44fNϕ

C) E = I²R

D) E = V + IR

Explanation:

A) Incorrect – Used in sine waveform derivation, not standard EMF eq.

B) Correct – Standard formula: E = 4.44 × f × N × ϕ.

C) Incorrect – Power loss formula.

D) Incorrect – Kirchhoff's law, not transformer EMF.

4. In an ideal transformer, core loss is:

A) Very high

B) Zero

C) Negligible but not zero

D) Infinite

Explanation:

A) Incorrect – High core loss is inefficient.

B) Correct – In an ideal transformer, both core and copper losses are zero.

C) Incorrect – Applies to real transformers, not ideal.

D) Incorrect – Physically impossible.

5. The no-load current in a transformer is:

A) In phase with voltage

B) Lagging the voltage

C) Leading the voltage

D) Opposite to voltage

Explanation:

A) Incorrect – Would imply resistive load.

B) Correct – Due to inductive nature of core magnetizing current.

C) Incorrect – Capacitive behavior not applicable.

D) Incorrect – Not directionally opposite.

6. The leakage flux in a transformer is:

A) Helpful in energy transfer

B) Confined to core only

C) Lost and does not link both windings

D) Equal to main flux

Explanation:

A) Incorrect – Only main flux aids in transfer.

B) Incorrect – Leakage flux exists outside the core.

C) Correct – It is wasted magnetic flux.

D) Incorrect – It is less than main flux.

7. Which of the following statement is wrong for an ideal transformer?

A) No copper loss

B) Zero core loss

C) Perfect magnetic coupling

D) Secondary current leads primary current

Explanation:

A) Correct – Ideal assumption.

B) Correct – Ideal assumption.

C) Correct – No leakage flux assumed.

D) Incorrect – In an ideal transformer, power factor is same on both sides.

8. Which assumption is made in the transformer EMF equation derivation?

A) Non-sinusoidal waveform

B) Uniform magnetic flux

C) Leakage flux is dominant

D) No magnetization required

Explanation:

A) Incorrect – Assumes sinusoidal flux.

B) Correct – Needed for constant voltage per turn.

C) Incorrect – Leakage is ignored.

D) Incorrect – Magnetizing current is required.

9. What is the condition for maximum efficiency in a transformer?

A) Iron loss = Copper loss

B) Iron loss > Copper loss

C) Copper loss = 0

D) Total loss is minimum

Explanation:

A) Correct – At this point, efficiency is maximized.

B) Incorrect – Not optimal.

C) Incorrect – Not practical.

D) Vague, needs specific ratio.

10. In the OC test of a transformer, the voltmeter is connected across:

A) High-voltage side

B) Low-voltage side

C) Across core

D) Across load

Explanation:

A) Incorrect – High voltage side not energized during OC test.

B) Correct – Low-voltage side energized to avoid insulation risk.

C) Incorrect – Not measurable directly.

D) Incorrect – Test is done without load.

11. The purpose of laminating the core in a transformer is:

A) To increase eddy current loss

B) To reduce hysteresis loss

C) To reduce eddy current loss

D) To improve magnetic coupling

Explanation:

A) Incorrect – Laminations reduce, not increase, eddy current loss.

B) Incorrect – Hysteresis loss is minimized using low-hysteresis material, not laminations.

C) Correct – Laminations increase resistance to eddy currents.

D) Incorrect – Coupling depends more on winding placement and core design.

12. The efficiency of a transformer is maximum when:

A) It is under full load

B) It is under no-load

C) Iron loss equals copper loss

D) Copper loss is more than iron loss

Explanation:

A) Incorrect – Not always at full load.

B) Incorrect – At no-load, efficiency is low due to zero output.

C) Correct – Minimum total loss occurs here.

D) Incorrect – Not optimal.

13. Which of the following is a unit of magnetic flux?

A) Tesla

B) Henry

C) Weber

D) Ohm

Explanation:

A) Tesla is flux density unit.

B) Henry is for inductance.

C) Correct – Magnetic flux is measured in Weber.

D) Ohm is resistance unit.

14. In a transformer, if the primary turns are more than secondary, it is called:

A) Step-up transformer

B) Auto transformer

C) Step-down transformer

D) Isolation transformer

Explanation:

A) Incorrect – That's when secondary has more turns.

B) Incorrect – Autotransformer uses single winding.

C) Correct – Fewer turns in secondary means lower voltage.

D) Incorrect – Isolation transformer has 1:1 ratio.

15. Core losses in a transformer depend on:

A) Load current

B) Supply voltage and frequency

C) Temperature

D) Load power factor

Explanation:

A) Incorrect – Core loss is independent of load.

B) Correct – Higher voltage/frequency increases core loss.

C) Incorrect – Only affects copper loss slightly.

D) Incorrect – Only affects copper loss and regulation.

16. The EMF equation E = 4.44 f N Φ assumes:

A) Pure resistive load

B) Square waveform

C) Sinusoidal waveform

D) Constant voltage

Explanation:

A) Incorrect – EMF equation not load-dependent.

B) Incorrect – Peak factor changes for square wave.

C) Correct – The 4.44 factor is derived for sine wave.

D) Incorrect – Voltage may vary in applications.

17. Which of the following is not associated with transformer testing?

A) Open Circuit Test

B) Short Circuit Test

C) Back-to-Back Test

D) Load Flow Test

Explanation:

A) Correct – Used to measure core loss.

B) Correct – Used to measure copper loss.

C) Correct – Also called Sumpner's test.

D) Incorrect – Load flow is a power system analysis method.

18. The transformer oil is used for:

A) Cooling and lubrication

B) Cooling and insulation

C) Increasing core efficiency

D) Preventing eddy current

Explanation:

A) Incorrect – Oil is not for lubrication.

B) Correct – It cools windings and insulates.

C) Incorrect – Core efficiency isn't directly affected.

D) Incorrect – Eddy current depends on core design.

19. Which of the following affects the regulation of a transformer?

A) Load power factor

B) Core material

C) Ambient temperature

D) No-load current

Explanation:

A) Correct – Lagging loads increase voltage drop.

B) Incorrect – Affects losses, not regulation.

C) Incorrect – Minor impact.

D) Incorrect – No-load current is small.

20. Which of the following is true about an ideal transformer?

A) Has leakage flux

B) Has copper loss

C) Has 100% efficiency

D) Core loss is maximum

Explanation:

A) Incorrect – Assumes perfect magnetic coupling.

B) Incorrect – Copper loss is zero in ideal case.

C) Correct – No losses assumed.

D) Incorrect – Core loss is zero.

Unit 3: Measurements and Instruments

Classification and characteristics of instruments

1. Which of the following instruments is primarily used as a standardizing instrument in laboratories?

A) Indicating instruments

B) Recording instruments

C) Integrating instruments

D) Absolute instruments

2. The smallest change in input that an instrument can detect is known as:

A) Sensitivity

B) Resolution

C) Accuracy

D) Precision

3. Match the following characteristics with their definitions:

List I	List II
P. Accuracy	1. Degree of closeness to the true value
Q. Precision	2. Degree of repeatability under unchanged conditions
R. Sensitivity	3. Ratio of change in output to change in input
S. Linearity	4. Ability to produce output proportional to input over the range

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

4. Which of the following statements about damping in measuring instruments is incorrect?

A) Damping helps in reducing oscillations.

B) Overdamping leads to sluggish response.

C) Critical damping results in fastest response without overshoot.

D) Underdamping eliminates oscillations completely.

5. The unit of sensitivity in an instrument measuring voltage per unit displacement is:

A) V/m

B) m/V

C) V·m

D) mV/m

6. An instrument that records the total quantity of electricity over time is called:

A) Indicating instrument

B) Recording instrument

C) Integrating instrument

D) Absolute instrument

7. Which of the following is not a static characteristic of measuring instruments?

A) Accuracy

B) Linearity

C) Hysteresis

D) Time constant

8. The time required by an instrument to reach 63.2% of its final value after a step input is called:

A) Rise time

B) Settling time

C) Time constant

D) Delay time

9. Which of the following instruments can measure both AC and DC quantities?

A) Moving coil instruments

B) Moving iron instruments

C) Induction type instruments

D) Electrostatic instruments

10. The phenomenon where the output does not return to the same value when the input returns to its original value is known as:

A) Drift

B) Hysteresis

C) Dead zone

D) Non-linearity

11. Match the following instruments with their primary applications:

List I	List II
P. Thermocouple	1. Temperature measurement
Q. Strain gauge	2. Force measurement
R. LVDT	3. Displacement measurement
S. Piezoelectric sensor	4. Pressure measurement

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

12. In a first-order instrument, the relationship between input and output is given by:

A) $\tau(dy/dt) + y = Kx$

B) $dy/dt = Kx$

C) $y = Kx$

D) $\tau(d^2y/dt^2) + dy/dt + y = Kx$

13. Which of the following is an assumption made in the analysis of ideal instruments?

A) Zero hysteresis

B) Infinite sensitivity

C) Instantaneous response

D) All of the above

14. The ratio of the maximum deviation of the output from the ideal straight line to the full-scale output is known as:

A) Non-linearity

B) Hysteresis

C) Drift

D) Sensitivity

15. Which of the following statements is incorrect regarding moving coil instruments?

A) They are suitable for DC measurements.

B) They have a uniform scale.

C) They can be used for AC measurements without modification.

D) They operate based on the interaction between magnetic fields.

16. The dynamic characteristic that defines how quickly an instrument responds to changes in input is called:

A) Speed of response

B) Fidelity

C) Lag

D) Drift

17. Which of the following is not a desirable characteristic of a measuring instrument?

A) High sensitivity

B) High drift

C) High accuracy

D) High resolution

18. A dead zone in an instrument refers to:

A) Range of input over which there is no output change

B) Time lag in output due to friction

C) Hysteresis effect in magnetic instruments

D) Region where resolution is maximum

19. Match the following:

List I (Type)	List II (Application)
P. Indicating	1. Pointer shows real-time value
Q. Recording	2. Writes measured data over time
R. Integrating	3. Measures total energy over time
S. Absolute	4. Calibrated from physical constants

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-3, S-4

C) P-3, Q-1, R-4, S-2

D) P-4, Q-3, R-2, S-1

20. Which of the following formulas represents voltage sensitivity of a voltmeter?

A) S = 1 / (IR)

B) S = V / I

C) S = deflection / voltage applied

D) S = voltage × current

Unit 3: Measurements and Instruments

Classification and characteristics of instruments

1. Which of the following instruments is primarily used as a standardizing instrument in laboratories?

A) Indicating instruments

B) Recording instruments

C) Integrating instruments

D) Absolute instruments

Explanation: Absolute instruments provide measurements based on physical constants and are used for calibration purposes in laboratories.

2. The smallest change in input that an instrument can detect is known as:

A) Sensitivity

B) Resolution

C) Accuracy

D) Precision

Explanation: Resolution refers to the smallest measurable input change that produces a detectable change in the output.

3. Match the following characteristics with their definitions:

List I	List II
P. Accuracy	1. Degree of closeness to the true value
Q. Precision	2. Degree of repeatability under unchanged conditions
R. Sensitivity	3. Ratio of change in output to change in input
S. Linearity	4. Ability to produce output proportional to input over the range

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

Explanation: This matching aligns each characteristic with its correct definition.

4. Which of the following statements about damping in measuring instruments is incorrect?

A) Damping helps in reducing oscillations.

B) Overdamping leads to sluggish response.

C) Critical damping results in fastest response without overshoot.

D) Underdamping eliminates oscillations completely.

Explanation: Underdamping allows oscillations to persist; it does not eliminate them.

5. The unit of sensitivity in an instrument measuring voltage per unit displacement is:

A) V/m

B) m/V

C) V·m

D) mV/m

Explanation: Sensitivity is often expressed as output per unit input; for voltage per displacement, it's mV/m.

6. An instrument that records the total quantity of electricity over time is called:

A) Indicating instrument

B) Recording instrument

C) Integrating instrument

D) Absolute instrument

Explanation: Integrating instruments measure the total quantity over a period, such as energy meters.

7. Which of the following is not a static characteristic of measuring instruments?

A) Accuracy

B) Linearity

C) Hysteresis

D) Time constant

Explanation: Time constant is a dynamic characteristic, relating to the instrument's response over time.

8. The time required by an instrument to reach 63.2% of its final value after a step input is called:

A) Rise time

B) Settling time

C) Time constant

D) Delay time

Explanation: The time constant is the time taken to reach approximately 63.2% of the final value in a first-order system.

9. Which of the following instruments can measure both AC and DC quantities?

A) Moving coil instruments

B) Moving iron instruments

C) Induction type instruments

D) Electrostatic instruments

Explanation: Moving iron instruments can measure both AC and DC, whereas moving coil instruments are typically for DC.

10. The phenomenon where the output does not return to the same value when the input returns to its original value is known as:

A) Drift

B) Hysteresis

C) Dead zone

D) Non-linearity

Explanation: Hysteresis refers to the lag between input and output, causing different output values for the same input depending on the direction of change.

11. Match the following instruments with their primary applications:

List I	List II
P. Thermocouple	1. Temperature measurement
Q. Strain gauge	2. Force measurement
R. LVDT	3. Displacement measurement
S. Piezoelectric sensor	4. Pressure measurement

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

Explanation: Each sensor is matched with its typical application area.

12. In a first-order instrument, the relationship between input and output is given by:

A) $\tau(dy/dt) + y = Kx$

B) $dy/dt = Kx$

C) $y = Kx$

D) $\tau(d^2y/dt^2) + dy/dt + y = Kx$

Explanation: This is the standard first-order differential equation representing the dynamic behavior of such instruments.

13. Which of the following is an assumption made in the analysis of ideal instruments?

A) Zero hysteresis

B) Infinite sensitivity

C) Instantaneous response

D) All of the above

Explanation: Ideal instruments are assumed to have perfect characteristics, including zero hysteresis, infinite sensitivity, and instantaneous response.

14. The ratio of the maximum deviation of the output from the ideal straight line to the full-scale output is known as:

A) Non-linearity

B) Hysteresis

C) Drift

D) Sensitivity

Explanation: Non-linearity quantifies how much the actual output deviates from a linear relationship with the input.

15. Which of the following statements is incorrect regarding moving coil instruments?

A) They are suitable for DC measurements.

B) They have a uniform scale.

C) They can be used for AC measurements without modification.

D) They operate based on the interaction between magnetic fields.

Explanation: Moving coil instruments require rectifiers to measure AC; they are inherently DC devices

16. The dynamic characteristic that defines how quickly an instrument responds to changes in input is called:

A) Speed of response

B) Fidelity

C) Lag

D) Drift

17. Which of the following is not a desirable characteristic of a measuring instrument?

A) High sensitivity

B) High drift

C) High accuracy

D) High resolution

18. A dead zone in an instrument refers to:

A) Range of input over which there is no output change

B) Time lag in output due to friction

C) Hysteresis effect in magnetic instruments

D) Region where resolution is maximum

19. Match the following:

List I (Type)	List II (Application)
P. Indicating	1. Pointer shows real-time value
Q. Recording	2. Writes measured data over time
R. Integrating	3. Measures total energy over time
S. Absolute	4. Calibrated from physical constants

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-3, S-4

C) P-3, Q-1, R-4, S-2

D) P-4, Q-3, R-2, S-1

Explanation: Each instrument matches its correct function.

20. Which of the following formulas represents voltage sensitivity of a voltmeter?

A) S = 1 / (IR)

B) S = V / I

C) S = deflection / voltage applied

D) S = voltage × current

Unit 4: Electronic Devices and Circuits

Semi-conductor Diodes

1. Which of the following is the correct expression for reverse saturation current in a diode?

A. IS = I_0 e^(V/ηVT)

B. IS = I_0 e^(–V/ηVT)

C. IS = constant (temperature independent)

D. IS = V/R

2. What is the unit of diode reverse saturation current (IS)?

A. Volt

B. Ampere

C. Siemens

D. Henry

3. A PN junction diode under forward bias has:

A. Depletion region widened

B. Barrier potential increased

C. High resistance

D. Depletion region narrowed

4. Match the following diode types with their characteristics:

List I	List II
P. Zener Diode	1. Negative resistance region
Q. Tunnel Diode	2. Voltage regulation
R. Schottky Diode	3. High-speed switching

S. Varactor Diode 4. Voltage-controlled capacitance

A. P → 2 Q → 1 R → 3 S → 4

B. P → 3 Q → 4 R → 1 S → 2

C. P → 1 Q → 3 R → 2 S → 4

D. P → 4 Q → 2 R → 3 S → 1

5. Which of the following statement is wrong about semiconductor diodes?

A. Zener diode operates in reverse breakdown.

B. Tunnel diode exhibits negative resistance.

C. Schottky diode has slow switching speed.

D. Varactor diode is used for tuning circuits.

6. Formula for dynamic resistance (rd) of a diode in forward bias is:

A. rd = ηVT / IF

B. rd = V / IF

C. rd = IF / ηVT

D. rd = ηVT × IF

7. Diode ideality factor (η) for a typical silicon diode range between:

A. 0.5 to 1

B. 1 to 2

C. 2 to 3

D. 0 to 0.5

8. The cut-in voltage for a silicon diode is approximately:

A. 0.3 V

B. 0.7 V

C. 1.0 V

D. 0.1 V

9. Which diode is used in microwave frequency applications?

A. Tunnel Diode

B. LED

C. Zener Diode

D. Photodiode

10. In a forward-biased diode, what assumption is made in the ideal diode model?

A. It has infinite resistance

B. It has a threshold voltage

C. It conducts with zero voltage drop

D. It does not conduct at all

11. Which condition causes breakdown in a Zener diode?

A. Forward bias beyond 0.7V

B. Reverse bias below 0.3V

C. Reverse voltage exceeds Zener voltage

D. Forward current exceeds maximum rating

12. The reverse leakage current in a diode is mainly due to:

A. Electron-hole recombination

B. Tunneling effect

C. Minority carrier drift

D. Breakdown

13. What is the function of a clamping diode in a circuit?

A. Amplify signal

B. Convert AC to DC

C. Shift voltage level

D. Filter noise

14. Which of the following is a correct assumption in the piecewise linear diode model?

A. Infinite forward resistance

B. No threshold voltage

C. Constant voltage drop in conduction

D. Nonlinear behavior throughout

15. Which of the following is NOT a characteristic of a Schottky diode?

A. Fast switching

B. Low forward voltage drop

C. Suitable for high-frequency circuits

D. High reverse breakdown voltage

16. Identify the wrong statement regarding tunnel diodes:

A. They exhibit negative resistance

B. They operate at very low voltages

C. They can amplify signals

D. They are used for rectification

17. What is the main function of a varactor diode?

A. Generate high current

B. Act as a voltage source

C. Provide variable capacitance

D. Amplify AC signals

18. Which diode is used in voltage regulation circuits?

A. Tunnel diode

B. Zener diode

C. PIN diode

D. Schottky diode

19. The built-in potential (barrier voltage) of a silicon PN junction is approximately:

A. 0.1 V

B. 0.3 V

C. 0.7 V

D. 1.1 V

20. In a half-wave rectifier using a diode, the output DC voltage is given approximately by:

A. Vmax/π

B. 2Vmax/π

C. Vmax

D. Vmax/2

Unit 4: Electronic Devices and Circuits

Semi-conductor Diodes

1. Which of the following is the correct expression for reverse saturation current in a diode?

A. IS = I_0 e^(V/ηVT)

B. IS = I_0 e^(–V/ηVT)

C. IS = constant (temperature independent)

D. IS = V/R

Explanation:

A. Incorrect – This is for forward bias.

B. Correct – Reverse saturation current is nearly constant but follows an exponential decay with negative voltage.

C. Incorrect – It does vary with temperature.

D. Incorrect – Ohm's Law; not for diodes.

2. What is the unit of diode reverse saturation current (IS)?

A. Volt

B. Ampere

C. Siemens

D. Henry

Explanation:

Wrong – Unit of potential.

Correct – IS is current (tiny µA or nA scale).

Wrong – Unit of conductance.

Wrong – Unit of inductance.

3. A PN junction diode under forward bias has:

A. Depletion region widened

B. Barrier potential increased

C. High resistance

D. Depletion region narrowed

Explanation:

A. False – Reverse bias widens it.

B. False – Forward bias reduces it.

C. False – It becomes conductive.

D. True – Allows current flow.

4. Match the following diode types with their characteristics:

List I	List II
P. Zener Diode	1. Negative resistance region
Q. Tunnel Diode	2. Voltage regulation
R. Schottky Diode	3. High-speed switching
S. Varactor Diode	4. Voltage-controlled capacitance

A. P → 2 Q → 1 R → 3 S → 4

B. P → 3 Q → 4 R → 1 S → 2

C. P → 1 Q → 3 R → 2 S → 4

D. P → 4 Q → 2 R → 3 S → 1

5. Which of the following statement is wrong about semiconductor diodes?

A. Zener diode operates in reverse breakdown.

B. Tunnel diode exhibits negative resistance.

C. Schottky diode has slow switching speed.

D. Varactor diode is used for tuning circuits.

Explanation:

A. Correct – Zener is designed for this.

B. Correct – Due to tunneling.

C. Wrong – Schottky has fast switching.

D. Correct – Used in voltage-controlled oscillators.

6. Formula for dynamic resistance (rd) of a diode in forward bias is:

A. rd = ηVT / IF

B. rd = V / IF

C. rd = IF / ηVT

D. rd = ηVT × IF

Explanation:

Correct – Derived from diode equation.

Incorrect – That's static resistance.

C/D. Wrong – Incorrect dimensionally.

7. Diode ideality factor (η) for a typical silicon diode range between:

A. 0.5 to 1

B. 1 to 2

C. 2 to 3

D. 0 to 0.5

Explanation:

A. Too low

B. Correct – η is between 1 (ideal) and 2 (non-ideal).

C. Too high

D. Not realistic

8. The cut-in voltage for a silicon diode is approximately:

A. 0.3 V

B. 0.7 V

C. 1.0 V

D. 0.1 V

Explanation:

A. Germanium diode

B. Correct – Silicon

C. Too high

D. Too low

9. Which diode is used in microwave frequency applications?

A. Tunnel Diode

B. LED

C. Zener Diode

D. Photodiode

Explanation:

A. Correct – Operates in GHz range

B. Used in lighting

C. Voltage regulation only

D. Light detection

10. In a forward-biased diode, what assumption is made in the ideal diode model?

A. It has infinite resistance

B. It has a threshold voltage

C. It conducts with zero voltage drop

D. It does not conduct at all

Explanation:

A. Reverse bias behavior

B. Present in real diode model

C. Correct – In ideal model

D. Incorrect – Forward bias conducts

11. Which condition causes breakdown in a Zener diode?

A. Forward bias beyond 0.7V

B. Reverse bias below 0.3V

C. Reverse voltage exceeds Zener voltage

D. Forward current exceeds maximum rating

Explanation:

A. Normal conduction.

B. Not enough to conduct.

C. Triggers Zener breakdown.

D. Could damage but doesn't cause Zener action.

12. The reverse leakage current in a diode is mainly due to:

A. Electron-hole recombination

B. Tunneling effect

C. Minority carrier drift

D. Breakdown

Explanation:

A. Forward bias behavior.

B. Tunnel diode-specific.

C. Minority carriers cause leakage.

D. Happens at high voltages only.

13. What is the function of a clamping diode in a circuit?

A. Amplify signal

B. Convert AC to DC

C. Shift voltage level

D. Filter noise

Explanation:

A. Needs transistor/op-amp.

B. Rectifier, not clamp.

C. Clamp changes voltage reference.

D. Done by capacitors/inductors.

14. Which of the following is a correct assumption in the piecewise linear diode model?

A. Infinite forward resistance

B. No threshold voltage

C. Constant voltage drop in conduction

D. Nonlinear behavior throughout

Explanation:

A. Not true in conduction.

B. Ideal diode assumption.

C. Assumes 0.7V (Si) drop.

D. Approximation is linearized.

15. Which of the following is NOT a characteristic of a Schottky diode?

A. Fast switching

B. Low forward voltage drop

C. Suitable for high-frequency circuits

D. High reverse breakdown voltage

Explanation:

A. Yes – key feature.

B. Yes – ~0.2–0.3V drop.

C. Yes – GHz range.

D. Low reverse voltage rating.

16. Identify the wrong statement regarding tunnel diodes:

A. They exhibit negative resistance

B. They operate at very low voltages

C. They can amplify signals

D. They are used for rectification

Explanation:

A. True – key feature

B. True – ~0.1V operation

C. Yes – due to negative resistance

D. Tunnel diodes are not rectifiers.

17. What is the main function of a varactor diode?

A. Generate high current

B. Act as a voltage source

C. Provide variable capacitance

D. Amplify AC signals

Explanation:

A. No – acts like capacitor

B. No – passive device

C. Capacitance depends on reverse bias

D. Not used for amplification

18. Which diode is used in voltage regulation circuits?

A. Tunnel diode

B. Zener diode

C. PIN diode

D. Schottky diode

Explanation:

A. Used in oscillators

B. Zener regulates voltage

C. Used in RF switches

D. Used in fast switching

19. The built-in potential (barrier voltage) of a silicon PN junction is approximately:

A. 0.1 V

B. 0.3 V

C. 0.7 V

D. 1.1 V

Explanation:

A. Too low

B. Germanium diode

C. Correct for silicon

D. Bandgap of Si, not barrier voltage

20. In a half-wave rectifier using a diode, the output DC voltage is given approximately by:

A. Vmax/π

B. 2Vmax/π

C. Vmax

D. Vmax/2

Explanation:

A. Vavg = Vmax/π (for sinusoidal input)

B. For full-wave

C. Peak voltage

D. Incorrect formula

Unit V: Analog and Digital Electronics

Operational amplifiers Specifications - characteristics - Applications

Q1. What is the ideal input impedance of an op-amp?

A) 0 Ω

B) 10 kΩ

C) Infinite

D) 1 Ω

Q2. The gain of an inverting op-amp is given by…

A) -Rf / Ri

B) Rf × Ri

C) Ri / Rf

D) 1 + (Rf / Ri)

Q3. What is the unit of Slew Rate?

A) V

B) A

C) V/s

D) V/µs

Q4. Common-mode rejection ratio (CMRR) is defined as…

A) Ratio of output to input voltage

B) Ratio of differential gain to common-mode gain

C) Output impedance over input impedance

D) Feedback voltage over input voltage

Q5. Which condition ensures linear operation of op-amp?

A) Positive feedback

B) Output shorted

C) Negative feedback

D) Open loop

Q6. In an ideal op-amp, the output impedance is assumed to be…

A) High

B) Zero

C) Infinite

D) Equal to input impedance

Q7. Match the Following (Theory & Formula):

List I:	List II:
P. Slew Rate	1. Ad / Ac
Q. Gain Bandwidth Product	2. Vout / time
R. CMRR	3. V/µs
S. Offset Voltage	4. Frequency × Gain

A) P–2, Q–4, R–1, S–3

B) P–3, Q–4, R–1, S–2

C) P–1, Q–3, R–2, S–4

D) P–4, Q–2, R–3, S–1

Q8. Which of the following statements is WRONG about op-amp characteristics?

A) Infinite gain in open loop

B) Infinite bandwidth in real op-amps

C) Infinite input resistance

D) Zero output resistance

Q9. For a non-inverting op-amp, voltage gain is given by…

A) Vout = –(Rf/R1) Vin

B) Vout = (1 + Rf/R1) Vin

C) Vout = Vin × Rf

D) Vout = Vin / Rf

Q10. What is the function of an op-amp integrator?

A) Adds input signals

B) Produces triangular wave

C) Produces square wave

D) Output is proportional to the integral of input

Q11. Input offset voltage is measured in…

A) Ohms

B) Volts

C) mV or µV

D) Amperes

Q12. What does Gain Bandwidth Product (GBP) represent?

A) Product of slew rate and gain

B) Maximum output current

C) Frequency at which gain becomes 1

D) Constant value of gain × bandwidth

Q13. In ideal op-amp analysis, voltage difference between inputs is…

A) Infinite

B) Equal to output

C) Zero

D) 1 V

Q14. For an op-amp to work as a voltage follower, the gain should be…

A) Zero

B) One

C) Infinity

D) –1

Q15. Match the Following (Applications):

List I:	List II:
P. Integrator	1. Converts square to triangle
Q. Comparator	2. Removes signal noise and adds hysteresis
R. Voltage Follower	3. Maintains same input and output voltage
S. Schmitt Trigger	4. Compares two voltages

A: P–1, Q–4, R–3, S–2

B: P–2, Q–1, R–3, S–4

C: P–3, Q–2, R–4, S–1

D: P–4, Q–3, R–1, S–2

Q16. Which of the following is NOT a specification of op-amp?

A) CMRR

B) Slew Rate

C) Cut-off frequency

D) Input offset voltage

Q17. Slew Rate =?

A) (Vin × gain) / time

B) (Change in Vout) / time

C) Iout / Cload

D) 1 / (2πRC)

Q18. Which of the following statement is WRONG?

A) Comparator uses open loop

B) Op-amp can act as integrator

C) Slew rate limits max frequency

D) Voltage follower has gain > 1

Q19. Gain Bandwidth Product (GBP) is measured in…

A) V

B) Hz

C) V/s

D) Hz or MHz

Q20. What is output voltage of an integrator using op-amp?

A) Vout = R × C

B) Vout = R / C × Vin

C) Vout = –(1/RC) ∫Vin dt

D) Vout = –RC × Vin

Unit V: Analog and Digital Electronics

Operational amplifiers Specifications - characteristics - Applications

Q1. What is the ideal input impedance of an op-amp?

A) 0 Ω

B) 10 kΩ

C) Infinite

D) 1 Ω

Explanation: Ideal op-amp doesn't load the input, hence infinite input impedance.

Q2. The gain of an inverting op-amp is given by…

A) -Rf / Ri

B) Rf × Ri

C) Ri / Rf

D) 1 + (Rf / Ri)

Explanation: Inverting gain = – (Feedback resistance/Input resistance)

Q3. What is the unit of Slew Rate?

A) V

B) A

C) V/s

D) V/μs

Explanation: Slew rate measures how fast output changes → V/μs

Q4. Common-mode rejection ratio (CMRR) is defined as…

A) Ratio of output to input voltage

B) Ratio of differential gain to common-mode gain

C) Output impedance over input impedance

D) Feedback voltage over input voltage

Explanation: CMRR = Ad / Acm, expressed in dB

Q5. Which condition ensures linear operation of op-amp?

A) Positive feedback

B) Output shorted

C) Negative feedback

D) Open loop

Explanation: Negative feedback stabilizes and ensures linear region

Q6. In an ideal op-amp, the output impedance is assumed to be…

A) High

B) Zero

C) Infinite

D) Equal to input impedance

Explanation: Ideal op-amp has zero output impedance to drive any load

Q7. Match the Following (Theory & Formula):

List I:	List II:
P. Slew Rate	1. Ad / Ac
Q. Gain Bandwidth Product	2. Vout / time
R. CMRR	3. V/µs
S. Offset Voltage	4. Frequency × Gain

A) P–2, Q–4, R–1, S–3

B) P–3, Q–4, R–1, S–2

C) P–1, Q–3, R–2, S–4

D) P–4, Q–2, R–3, S–1

Q8. Which of the following statements is WRONG about op-amp characteristics?

A) Infinite gain in open loop

B) Infinite bandwidth in real op-amps

C) Infinite input resistance

D) Zero output resistance

Explanation: Real op-amps have limited bandwidth; only ideal ones assumed infinite

Q9. For a non-inverting op-amp, voltage gain is given by…

A) Vout = –(Rf/R1) Vin

B) Vout = (1 + Rf/R1) Vin

C) Vout = Vin × Rf

D) Vout = Vin / Rf

Explanation: Non-inverting gain = 1 + (Rf / Ri)

Q10. What is the function of an op-amp integrator?

A) Adds input signals

B) Produces triangular wave

C) Produces square wave

D) Output is proportional to the integral of input

Explanation: Integrator outputs ∫Vin dt, hence slows signal response

Q11. Input offset voltage is measured in…

A) Ohms

B) Volts

C) mV or µV

D) Amperes

Explanation: Offset is small voltage needed to zero the output

Q12. What does Gain Bandwidth Product (GBP) represent?

A) Product of slew rate and gain

B) Maximum output current

C) Frequency at which gain becomes 1

D) Constant value of gain × bandwidth

Explanation: GBP = Gain × Bandwidth, constant for op-amp

Q13. In ideal op-amp analysis, voltage difference between inputs is…

A) Infinite

B) Equal to output

C) Zero

D) 1 V

Explanation: Ideal op-amp keeps V+ ≈ V– under negative feedback

Q14. For an op-amp to work as a voltage follower, the gain should be…

A) Zero

B) One

C) Infinity

D) –1

Explanation: Voltage follower = unity gain buffer, gain = 1

Q15. Match the Following (Applications):

List I:	List II:
P. Integrator	1. Converts square to triangle
Q. Comparator	2. Removes signal noise and adds hysteresis
R. Voltage Follower	3. Maintains same input and output voltage
S. Schmitt Trigger	4. Compares two voltages

A: P–1, Q–4, R–3, S–2

B: P–2, Q–1, R–3, S–4

C: P–3, Q–2, R–4, S–1

D: P–4, Q–3, R–1, S–2

Q16. Which of the following is NOT a specification of op-amp?

A) CMRR

B) Slew Rate

C) Cut-off frequency

D) Input offset voltage

Explanation: Cut-off freq is filter spec; not op-amp parameter

Q17. Slew Rate =?

A) (Vin × gain) / time

B) (Change in Vout) / time

C) Iout / Cload

D) 1 / (2πRC)

Explanation: Slew Rate = ΔVout / Δt, in V/µs

Q18. Which of the following statement is WRONG?

A) Comparator uses open loop

B) Op-amp can act as integrator

C) Slew rate limits max frequency

D) Voltage follower has gain > 1

Explanation: Voltage follower has gain = 1, not greater

Q19. Gain Bandwidth Product (GBP) is measured in…

A) V

B) Hz

C) V/s

D) Hz or MHz

Explanation: GBP is frequency unit, typically MHz

Q20. What is output voltage of an integrator using op-amp?

A) Vout = R × C

B) Vout = R / C × Vin

C) Vout = –(1/RC) ∫Vin dt

D) Vout = –RC × Vin

Explanation:

A) R × C is a time constant, not voltage

B) Incorrect form; integrator involves integration

C) Correct – Integrator output is proportional to integral of input, with scaling factor –1/RC

D) RC × Vin gives a scaled voltage, not an integral

Unit VI: Generation, Transmission and Switch Gear

Generation of Electrical Energy

Q1. What distinguishes a dynamo from an alternator in terms of current output?

A) Dynamo produces alternating current; alternator produces direct current

B) Dynamo produces direct current; alternator produces alternating current

C) Both produce alternating current

D) Both produce direct current

Q2. What is the primary function of a transformer in a power system?

A) To convert mechanical energy into electrical energy

B) To step up or step-down voltage levels

C) To store electrical energy

D) To convert AC to DC

Q3. If a power plant has a maximum demand of 100 MW and an annual load factor of 40%, what is the total energy generated in a year?

A) 3504×10^5 kWh

B) 4000×10^5 kWh

C) 8760×10^5 kWh

D) 4380×10^5 kWh

Q4. What is the unit of electrical energy?

A) Watt

B) Volt

C) Ampere

D) Kilowatt-hour

Q5. Under which condition is a hydroelectric power plant most effective?

A) In flat terrains with slow-moving water

B) In hilly areas with high water flow

C) In desert regions with minimal rainfall

D) In coastal areas with tidal movements

Q6. Assuming a solar panel has an efficiency of 15% and receives solar irradiance of 1000 W/m², what is the power output per square meter?

A) 100 W

B) 150 W

C) 200 W

D) 250 W

Q7. Match the following:

P. Seebeck Effect 1. Conversion of light into electricity

Q. Photovoltaic Effect 2. Induced EMF in a conductor due to changing magnetic field

R. Faraday's Law 3. Heat produced in a conductor is proportional to the square of current

S. Joule's Law 4. Voltage generated at junctions of different metals due to temperature difference

A) P-4, Q-1, R-2, S-3

B) P-1, Q-2, R-3, S-4

C) P-2, Q-3, R-4, S-1

D) P-3, Q-4, R-1, S-2

Q8. Identify the incorrect statement:

A) Nuclear power plants emit large amounts of CO_2

B) Hydroelectric power is renewable

C) Solar panels convert sunlight directly into electricity

D) Wind turbines harness kinetic energy from wind

Q9. The efficiency (η) of a power plant is given by:

A) η = (Input Energy / Output Energy) × 100%

B) η = (Output Energy / Input Energy) × 100%

C) η = (Input Power / Output Power) × 100%

D) η = (Output Power / Input Power) × 100%

Q10. What is the primary advantage of using gas turbines in power generation?

A) Low fuel consumption

B) High efficiency at base load

C) Quick start-up and shutdown

D) Low maintenance cost

Q11. What is 'load factor' in power systems?

A) Ratio of maximum load to average load

B) Ratio of average load to maximum demand

C) Ratio of energy generated to energy consumed

D) Ratio of peak load to base load

Q12. Calculate the load factor of a power station that has a maximum demand of 200 MW and an average load of 150 MW over a year.

A) 0.60

B) 0.65

C) 0.75

D) 0.80

Q13. What is the standard unit of electrical energy?

A) Watt

B) Volt

C) Ampere

D) Kilowatt-hour

Q14. What does the term 'diversity factor' refer to in power systems?

A) Ratio of average load to maximum demand

B) Ratio of sum of individual maximum demands to the maximum demand on the system

C) Ratio of maximum demand to connected load

D) Ratio of actual energy produced to maximum possible energy

Q15. Under which condition is a thermal power plant most efficient?

A) At peak load

B) At base load

C) During startup

D) During shutdown

Q16. Assuming a hydroelectric plant operates with a head of 100 meters and a flow rate of 50 cubic meters per second, what is the theoretical power output? (Assume efficiency = 100%, g = 9.81 m/s²)

A) 49.05 MW

B) 39.24 MW

C) 29.43 MW

D) 19.62 MW

Q17. Match the following:

P. Load Factor	**1. Ratio of average load to maximum demand**
Q. Capacity Factor	**2. Ratio of actual energy produced to maximum possible energy**
R. Demand Factor	**3. Ratio of maximum demand to connected load**
S. Utilization Factor	**4. Ratio of maximum demand to rated capacity**

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

Q18. Identify the incorrect statement:

A) Nuclear power plants emit large amounts of CO_2

B) Hydroelectric power is renewable

C) Solar panels convert sunlight directly into electricity

D) Wind turbines harness kinetic energy from wind

Q19. The efficiency (η) of a power plant is given by:

A) η = (Input Energy / Output Energy) × 100%

B) η = (Output Energy / Input Energy) × 100%

C) η = (Input Power / Output Power) × 100%

D) η = (Output Power / Input Power) × 100%

Q20. What is the primary advantage of using gas turbines in power generation?

A) Low fuel consumption

B) High efficiency at base load

C) Quick start-up and shutdown

D) Low maintenance cost

Unit VI: Generation, Transmission and Switch Gear

Generation of Electrical Energy

Q1. What distinguishes a dynamo from an alternator in terms of current output?

A) Dynamo produces alternating current; alternator produces direct current

B) Dynamo produces direct current; alternator produces alternating current

C) Both produce alternating current

D) Both produce direct current

Explanation: A dynamo uses a commutator to convert the alternating current generated in the armature into direct current, whereas an alternator produces alternating current directly.

Q2. What is the primary function of a transformer in a power system?

A) To convert mechanical energy into electrical energy

B) To step up or step-down voltage levels

C) To store electrical energy

D) To convert AC to DC

Explanation: Transformers adjust voltage levels for efficient power transmission and distribution.

Q3. If a power plant has a maximum demand of 100 MW and an annual load factor of 40%, what is the total energy generated in a year?

A) 3504 × 10^5 kWh

B) 4000 × 10^5 kWh

C) 8760 × 10^5 kWh

D) 4380 × 10^5 kWh

Explanation: Total energy = Maximum Demand × Load Factor × Hours in a year = 100 MW × 0.4 × 8760 h = 3504 × 10^5 kWh.

Q4. What is the unit of electrical energy?

A) Watt

B) Volt

C) Ampere

D) Kilowatt-hour

Explanation: Electrical energy is measured in kilowatt-hours (kWh), representing the energy consumed by a load of one kilowatt over one hour.

Q5. Under which condition is a hydroelectric power plant most effective?

A) In flat terrains with slow-moving water

B) In hilly areas with high water flow

C) In desert regions with minimal rainfall

D) In coastal areas with tidal movements

Explanation: Hydroelectric plants are most effective in hilly areas where water can flow rapidly from a height, providing potential energy for electricity generation.

Q6. Assuming a solar panel has an efficiency of 15% and receives solar irradiance of 1000 W/m², what is the power output per square meter?

A) 100 W

B) 150 W

C) 200 W

D) 250 W

Explanation: Power output = Efficiency × Solar irradiance = 0.15 × 1000 W/m² = 150 W/m².

Q7. Match the following:

P. Seebeck Effect **1. Conversion of light into electricity**

Q. Photovoltaic Effect **2. Induced EMF in a conductor due to changing magnetic field**

R. Faraday's Law **3. Heat produced in a conductor is proportional to the square of current**

S. Joule's Law **4. Voltage generated at junctions of different metals due to temperature difference**

A) P-4, Q-1, R-2, S-3

B) P-1, Q-2, R-3, S-4

C) P-2, Q-3, R-4, S-1

D) P-3, Q-4, R-1, S-2

Q8. Identify the incorrect statement:

A) Nuclear power plants emit large amounts of CO_2

B) Hydroelectric power is renewable

C) Solar panels convert sunlight directly into electricity

D) Wind turbines harness kinetic energy from wind

Explanation: Nuclear power plants have low greenhouse gas emissions compared to fossil fuel-based plants.

Q9. The efficiency (η) of a power plant is given by:

A) η = (Input Energy / Output Energy) × 100%

B) η = (Output Energy / Input Energy) × 100%

C) η = (Input Power / Output Power) × 100%

D) η = (Output Power / Input Power) × 100%

Explanation: Efficiency is the ratio of useful output power to the total input power, expressed as a percentage.

Q10. What is the primary advantage of using gas turbines in power generation?

A) Low fuel consumption

B) High efficiency at base load

C) Quick start-up and shutdown

D) Low maintenance cost

Explanation: Gas turbines can be started and stopped quickly, making them suitable for peak load operations.

Q11. What is 'load factor' in power systems?

A) Ratio of maximum load to average load

B) Ratio of average load to maximum demand

C) Ratio of energy generated to energy consumed

D) Ratio of peak load to base load

Explanation: Load factor indicates the efficiency and utilization of the electrical load over a period.

Q12. Calculate the load factor of a power station that has a maximum demand of 200 MW and an average load of 150 MW over a year.

A) 0.60

B) 0.65

C) 0.75

D) 0.80

Explanation:

Load Factor = Average Load / Maximum Demand

= 150 MW / 200 MW = 0.75

A load factor of 0.75 indicates that the station operates at 75% of its maximum capacity on average.

Q13. What is the standard unit of electrical energy?

A) Watt

B) Volt

C) Ampere

D) Kilowatt-hour

Explanation: Electrical energy is measured in kilowatt-hours (kWh), representing the energy consumed by a load of one kilowatt over one hour.

Q14. What does the term 'diversity factor' refer to in power systems?

A) Ratio of average load to maximum demand

B) Ratio of sum of individual maximum demands to the maximum demand on the system

C) Ratio of maximum demand to connected load

D) Ratio of actual energy produced to maximum possible energy

Explanation:

Diversity Factor = Sum of individual maximum demands / Maximum demand on the system

A higher diversity factor indicates a more efficient utilization of the system capacity.

Q15. Under which condition is a thermal power plant most efficient?

A) At peak load

B) At base load

C) During startup

D) During shutdown

Explanation: Thermal power plants operate most efficiently at base load, where they run continuously at optimal capacity, minimizing fuel consumption per unit of electricity generated.

Q16. Assuming a hydroelectric plant operates with a head of 100 meters and a flow rate of 50 cubic meters per second, what is the theoretical power output? (Assume efficiency = 100%, g = 9.81 m/s²)

A) 49.05 MW

B) 39.24 MW

C) 29.43 MW

D) 19.62 MW

Explanation:

Power = ρ × g × Q × H

= 1000 kg/m³ × 9.81 m/s² × 50 m³/s × 100 m

= 49,050,000 W = 49.05 MW

Q17. Match the following:

P. Load Factor	**1. Ratio of average load to maximum demand**
Q. Capacity Factor	**2. Ratio of actual energy produced to maximum possible energy**
R. Demand Factor	**3. Ratio of maximum demand to connected load**
S. Utilization Factor	**4. Ratio of maximum demand to rated capacity**

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B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

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C) η = (Input Power / Output Power) × 100%

D) η = (Output Power / Input Power) × 100%

Explanation: Efficiency is the ratio of useful output power to the total input power, expressed as a percentage.

Q20. What is the primary advantage of using gas turbines in power generation?

A) Low fuel consumption

B) High efficiency at base load

C) Quick start-up and shutdown

D) Low maintenance cost

Explanation: Gas turbines can be started and stopped quickly, making them suitable for peak load operations.

Unit VII: Distribution and Utilisation

AC and DC Distribution

1. In a DC distributor fed at both ends with equal voltages and uniformly loaded, the voltage drop at the center is:

A) Zero

B) Maximum

C) Minimum

D) Equal to the drop at the ends

2. The unit of conductance is:

A) Ohm (Ω)

B) Siemens (S)

C) Farad (F)

D) Henry (H)

3. Which of the following statements is incorrect regarding AC distribution systems?

A) Voltage drop depends on power factor

B) Power factor affects current distribution

C) Voltage drop is independent of load power factor

D) Load power factor is crucial in voltage regulation

4. Match the following terms with their definitions:

List I	List II
1. Feeder	A. Connects substation to area
2. Distributor	B. Supplies power to consumers

3. Service Main C. Connects distributor to load

4. Substation D. Steps down voltage for distribution

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

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

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

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

5. In a three-phase, four-wire AC distribution system, the neutral wire is primarily used to:

A) Carry load current

B) Provide a path for fault current

C) Balance the system under unbalanced loads

D) Increase system voltage

6. The formula for voltage drop (V) in a DC distributor with a uniformly distributed load (I per unit length) and resistance R per unit length over length L is:

A) $V = IRL$

B) $V = (IRL)/2$

C) $V = (IRL^2)/2$

D) $V = (IRL^2)/8$

7. Which of the following is an assumption made in analyzing DC distribution systems?

A) Load is constant and uniformly distributed

B) Resistance of conductors is negligible

C) Voltage drop is independent of current

D) Load power factor is considered

8. In AC distribution, the voltage drop across a feeder depends on:

A) Only the resistance of the feeder

B) Only the reactance of the feeder

C) Both resistance and reactance

D) Neither resistance nor reactance

9. Which of the following statements is true regarding the use of ring main systems in distribution?

A) They are less reliable than radial systems

B) They provide multiple paths for power flow

C) They are more expensive and less efficient

D) They cannot be used in urban areas

10. The primary reason for using higher voltage levels in distribution systems is to:

A) Reduce power losses

B) Increase current flow

C) Decrease conductor size

D) Simplify system design

11. In a DC three-wire system, if the loads on both sides are unequal, the balancer set:

A) Operates as a generator on both sides

B) Operates as a motor on both sides

C) Balances the voltage by acting as a motor on one side and generator on the other

D) Is not required

12. In AC distribution, power factor is considered because:

A) It increases conductor length

B) It influences load types

C) It affects voltage drops in lines

D) It doesn't impact distribution at all

13. A distributor differs from a feeder in that:

A) It carries current at a constant voltage

B) It does not supply consumers directly

C) It has no voltage drop

D) It transmits high voltage

14. The formula for transmission efficiency is:

A) η = (Receiving End Power / Sending End Power) × 100

B) η = (Sending End Power / Receiving End Power) × 100

C) η = (Loss Power / Input Power) × 100

D) η = (Output Voltage / Input Voltage) × 100

15. A major advantage of DC distribution is:

A) Lower transmission losses

B) Simpler voltage transformation

C) Easier fault location

D) Use of three-phase systems

16. In radial distribution systems, the main disadvantage is:

A) Simple design

B) Inexpensive construction

C) Poor reliability

D) High flexibility

17. The diversity factor is defined as:

A) Sum of individual max demands / Max demand on system

B) Max demand on system / Sum of individual max demands

C) Average demand / Max demand

D) Max demand / Average demand

18. Which of the following is not a correct assumption in distribution system analysis?

A) Loads are considered constant

B) Voltage drop is calculated only across resistive elements

C) Power factor is ignored in DC systems

D) Impedance of conductors is purely resistive in AC

19. In AC distribution, Ferranti effect refers to:

A) Sudden rise in load

B) Rise in receiving end voltage

C) Voltage drop at sending end

D) Current surge in feeder

20. Which of the following statement is wrong about DC distribution?

A) DC distribution has no skin effect

B) Voltage transformation is easier than AC

C) DC has lesser corona loss

D) Suitable for short distance transmission

Unit VII: Distribution and Utilisation

AC and DC Distribution

1. In a DC distributor fed at both ends with equal voltages and uniformly loaded, the voltage drop at the center is:

A) Zero

B) Maximum

C) Minimum

D) Equal to the drop at the ends

Explanation:

A) Incorrect. The voltage drop is not zero at the center; it's where the maximum drop occurs.

B) Correct. In a uniformly loaded DC distributor fed at both ends, the maximum voltage drop occurs at the center.

C) Incorrect. The minimum voltage drop is at the feeding points.

D) Incorrect. The voltage drop at the center is greater than at the ends.

2. The unit of conductance is:

A) Ohm (Ω)

B) Siemens (S)

C) Farad (F)

D) Henry (H)

Explanation:

A) Incorrect. Ohm is the unit of resistance.

B) Correct. Siemens is the unit of conductance, the reciprocal of resistance.

C) Incorrect. Farad is the unit of capacitance.

D) Incorrect. Henry is the unit of inductance.

3. Which of the following statements is incorrect regarding AC distribution systems?

A) Voltage drop depends on power factor

B) Power factor affects current distribution

C) Voltage drop is independent of load power factor

D) Load power factor is crucial in voltage regulation

Explanation:

A) Correct. Voltage drop in AC systems is influenced by power factor.

B) Correct. Power factor affects how current is distributed in the system.

C) Incorrect. Voltage drop is indeed dependent on load power factor.

D) Correct. Load power factor plays a significant role in voltage regulation.

4. Match the following terms with their definitions:

List I	List II
1. Feeder	A. Connects substation to area
2. Distributor	B. Supplies power to consumers
3. Service Main	C. Connects distributor to load
4. Substation	D. Steps down voltage for distribution

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

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

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

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

Explanation:

1-A) Feeder connects the substation to the distribution area.

2-B) Distributor supplies power directly to consumers.

3-C) Service main connects the distributor to the consumer's premises.

4-D) Substation steps down voltage for distribution.

5. In a three-phase, four-wire AC distribution system, the neutral wire is primarily used to:

A) Carry load current

B) Provide a path for fault current

C) Balance the system under unbalanced loads

D) Increase system voltage

Explanation:

A) Incorrect. Neutral does not carry load current under balanced conditions.

B) Incorrect. While it can carry fault current, its primary role is balancing.

C) Correct. The neutral wire balances the system when loads are unbalanced.

D) Incorrect. Neutral does not affect system voltage levels.

6. The formula for voltage drop (V) in a DC distributor with a uniformly distributed load (I per unit length) and resistance R per unit length over length L is:

A) $V = IRL$

B) $V = (IRL)/2$

C) $V = (IRL^2)/2$

D) $V = (IRL^2)/8$

Explanation:

A) Incorrect. This formula applies to concentrated loads.

B) Incorrect. This is for a point load at the end.

C) Correct. For uniformly distributed load, voltage drop is $(IRL^2)/2$.

D) Incorrect. This applies to distributors fed at both ends.

7. Which of the following is an assumption made in analyzing DC distribution systems?

A) Load is constant and uniformly distributed

B) Resistance of conductors is negligible

C) Voltage drop is independent of current

D) Load power factor is considered

Explanation:

A) Correct. It's commonly assumed that the load is constant and uniformly distributed.

B) Incorrect. Resistance is a critical factor in voltage drop calculations.

C) Incorrect. Voltage drop is directly related to current.

D) Incorrect. Power factor is not considered in DC systems.

8. In AC distribution, the voltage drop across a feeder depends on:

A) Only the resistance of the feeder

B) Only the reactance of the feeder

C) Both resistance and reactance

D) Neither resistance nor reactance

Explanation:

A) Incorrect. Reactance also plays a role.

B) Incorrect. Resistance also affects voltage drop.

C) Correct. Both resistance and reactance influence voltage drop in AC systems.

D) Incorrect. Both factors are significant.

9. Which of the following statements is true regarding the use of ring main systems in distribution?

A) They are less reliable than radial systems

B) They provide multiple paths for power flow

C) They are more expensive and less efficient

D) They cannot be used in urban areas

Explanation:

A) Incorrect. Ring main systems are more reliable due to redundancy.

B) Correct. They offer multiple paths, enhancing reliability.

C) Incorrect. While potentially more expensive, they are efficient in load distribution.

D) Incorrect. They are commonly used in urban distribution networks.

10. The primary reason for using higher voltage levels in distribution systems is to:

A) Reduce power losses

B) Increase current flow

C) Decrease conductor size

D) Simplify system design

Explanation:

A) Correct. Higher voltages reduce current for the same power, minimizing losses.

B) Incorrect. Higher voltage reduces current for the same power.

C) Incorrect. While conductor size can be reduced, the primary reason is loss reduction.

D) Incorrect. Higher voltages can complicate system design.

11. In a DC three-wire system, if the loads on both sides are unequal, the balancer set:

A) Operates as a generator on both sides

B) Operates as a motor on both sides

C) Balances the voltage by acting as a motor on one side and generator on the other

D) Is not required

Explanation:

A) Incorrect. It can't act as a generator on both sides simultaneously.

B) Incorrect. Similarly, both sides can't be in motor mode together.

C) Correct. In unbalanced conditions, the balancer set acts as a motor on the more heavily loaded side and as a generator on the lighter side to balance voltages.

D) Incorrect. Balancer sets are required when there is load imbalance.

12. In AC distribution, power factor is considered because:

A) It increases conductor length

B) It influences load types

C) It affects voltage drops in lines

D) It doesn't impact distribution at all

Explanation:

A) Incorrect. Conductor length is determined by physical layout.

B) Incorrect. Power factor is independent of load types.

C) Correct. Voltage drop in AC distribution lines is a function of power factor (due to real and reactive power components).

D) Incorrect. Power factor has a significant impact.

13. A distributor differs from a feeder in that:

A) It carries current at a constant voltage

B) It does not supply consumers directly

C) It has no voltage drop

D) It transmits high voltage

Explanation:

A) Correct. A distributor delivers current at nearly constant voltage and supplies directly to consumers.

B) Incorrect. Distributors do supply consumers.

C) Incorrect. There is a voltage drop in distributors due to load current.

D) Incorrect. Distribution is generally at lower voltages.

14. The formula for transmission efficiency is:

A) η = (Receiving End Power / Sending End Power) × 100

B) η = (Sending End Power / Receiving End Power) × 100

C) η = (Loss Power / Input Power) × 100

D) η = (Output Voltage / Input Voltage) × 100

Explanation:

A) Correct. Efficiency (η) = (Output/Input) × 100 = (Receiving/Sending) × 100.

B) Incorrect. This gives inverse efficiency.

C) Incorrect. This would be loss ratio, not efficiency.

D) Incorrect. Voltage ratio is not efficiency.

15. A major advantage of DC distribution is:

A) Lower transmission losses

B) Simpler voltage transformation

C) Easier fault location

D) Use of three-phase systems

Explanation:

A) Correct. DC has no skin effect, less corona, and lower losses.

B) Incorrect. Voltage transformation is more complex in DC than AC.

C) Incorrect. Fault location can be harder in DC.

D) Incorrect. Three-phase systems are AC-based.

16. In radial distribution systems, the main disadvantage is:

A) Simple design

B) Inexpensive construction

C) Poor reliability

D) High flexibility

Explanation:

A) Incorrect. Simplicity is an advantage.

B) Incorrect. Low cost is a benefit.

C) Correct. If the feeder fails, the entire section is cut off — low reliability.

D) Incorrect. Radial systems lack flexibility.

17. The diversity factor is defined as:

A) Sum of individual max demands / Max demand on system

B) Max demand on system / Sum of individual max demands

C) Average demand / Max demand

D) Max demand / Average demand

Explanation:

A) Correct. Diversity Factor = (Sum of individual max demands) / (System max demand)

B) Incorrect. This is the reciprocal.

C) Incorrect. This is the definition of load factor.

D) Incorrect. Not related to diversity.

18. Which of the following is not a correct assumption in distribution system analysis?

A) Loads are considered constant

B) Voltage drop is calculated only across resistive elements

C) Power factor is ignored in DC systems

D) Impedance of conductors is purely resistive in AC

Explanation:

A) Correct. For simplicity, loads are assumed constant.

B) Correct in DC, not AC.

C) Correct. DC has no power factor.

D) Incorrect. AC conductors have both resistance and inductive reactance.

19. In AC distribution, Ferranti effect refers to:

A) Sudden rise in load

B) Rise in receiving end voltage

C) Voltage drop at sending end

D) Current surge in feeder

Explanation:

A) Incorrect. This relates to load dynamics.

B) Correct. Ferranti Effect is the phenomenon where receiving end voltage exceeds sending end voltage in light load and long line conditions.

C) Incorrect. Not the cause.

D) Incorrect. It's a voltage issue, not current.

20. Which of the following statement is wrong about DC distribution?

A) DC distribution has no skin effect

B) Voltage transformation is easier than AC

C) DC has lesser corona loss

D) Suitable for short distance transmission

Explanation:

A) Correct. No skin effect in DC.

B) Wrong. Voltage transformation is more difficult in DC than in AC — this is the incorrect statement.

C) Correct. Corona loss is less due to no frequency.

D) Correct. DC is more efficient over short distances.

Unit VIII: Micro Controller and its Application

8051 micro controllers

Q1. What is the size of the internal RAM in the 8051 microcontrollers?

A) 64 bytes

B) 128 bytes

C) 256 bytes

D) 512 bytes

Q2. Match the following components of the 8051 microcontroller with their functions:

List I (Component)	List II (Function)
P. PSEN	1. Program Store Enable
Q. EA	2. External Access
R. ALE	3. Address Latch Enable
S. XTAL1/XTAL2	4. Oscillator Connections

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

Q3. In 8051 microcontroller schematics, what does the symbol 'EA' represent?

A) External Address

B) External Access

C) Enable Access

D) External Acknowledge

Q4. Which port of the 8051 microcontroller is used for both address and data?

A) Port 0

B) Port 1

C) Port 2

D) Port 3

Q5. Which of the following is not associated with the 8051 microcontroller?

A) Harvard Architecture

B) 16-bit Data Bus

C) On-chip ROM

D) Serial Communication

Q6. Which of the following is not considered a feature of the 8051 microcontrollers?

A) Four parallel I/O ports

B) Two 16-bit timers

C) 16-bit data bus

D) On-chip oscillator

Q7. What is the total number of interrupt sources in the 8051 microcontroller?

A) 2

B) 3

C) 5

D) 6

Q8. If the 8051 microcontroller needs to interface with an external memory, which pin should be set low?

A) EA

B) PSEN

C) ALE

D) RST

Q9. If the 8051 microcontroller operates at 12 MHz, what is the machine cycle frequency?

A) 12 MHz

B) 3 MHz

C) 1 MHz

D) 6 MHz

Q10. Which of the following ports in 8051 is only used for I/O and not for any alternate functions?

A) Port 0

B) Port 1

C) Port 2

D) Port 3

Q11. If a timer is set in mode 1 (16-bit) and clock is 12 MHz, how many microseconds does it take for one overflow?

A) 655.36 µs

B) 13.12 µs

C) 1092 µs

D) 54.25 µs

Q12. What is the unit of baud rate in serial communication?

A) Volts

B) Bits/sec

C) Bytes/sec

D) Hertz

Q13. What is a machine cycle in 8051?

A) One clock pulse

B) Four clock pulses

C) Six clock pulses

D) Twelve clock pulses

Q14. Which condition must be met for external memory access in 8051?

A) EA pin is high

B) EA pin is low

C) PSEN is low

D) ALE is high

Q15. If 8051 is connected to an 11.0592 MHz crystal, what is the serial baud rate with TH1 = FDH?

A) 2400

B) 4800

C) 9600

D) 19200

16. Match the Following (Formulas, Theory, Authors)

List I	List II
A. RISC	1. Fewer instructions
B. CISC	2. Complex instructions
C. Von Neumann	3. Shared memory for data/code
D. Harvard	4. Separate memory for data/code

A. - A → 1 - B → 2 - C → 3 - D → 4

B. - A → 2 - B → 1 - C → 3 - D → 4

C. - A → 1 - B → 2 - C → 4 - D → 3

D. - A → 2 - B → 1 - C → 4 - D → 3

Q17. Which statement is incorrect about 8051?

A) It has two 16-bit timers

B) It has 8-bit ALU

C) Port 0 needs pull-up resistors

D) PSEN is used to write to external memory

Q18. How is the timer overflow time calculated?

A) Timer counts × oscillator frequency

B) Oscillator frequency × 12

C) Timer counts / (oscillator / 12)

D) Timer counts / oscillator frequency

Q19. Timer 1 is in Mode 1 with TH1 = 0xF8, TL1 = 0x30. Oscillator = 12 MHz. What is delay?

A) 100 µs

B) 150 µs

C) 500 µs

D) 200 µs

Q20. What does 'RST' pin in 8051 represent?

A) Read/Store Terminal

B) Reset

C) Restart Signal Terminal

D) Register Set Terminal

Unit VIII: Micro Controller and its Application

8051 micro controllers

Q1. What is the size of the internal RAM in the 8051 microcontrollers?

A) 64 bytes

B) 128 bytes

C) 256 bytes

D) 512 bytes

Explanation:

A) 64 bytes: Incorrect. The 8051 has more internal RAM than this.

B) 128 bytes: Correct. The 8051 microcontroller has 128 bytes of internal RAM.

C) 256 bytes: Incorrect. While some variants may have more, the standard 8051 has 128 bytes.

D) 512 bytes: Incorrect. This exceeds the standard internal RAM size of the 8051.

Q2. Match the following components of the 8051 microcontroller with their functions:

List I (Component)	List II (Function)
P. PSEN	1. Program Store Enable
Q. EA	2. External Access
R. ALE	3. Address Latch Enable
S. XTAL1/XTAL2	4. Oscillator Connections

A) P-1, Q-2, R-3, S-4

B) P-2, Q-1, R-4, S-3

C) P-3, Q-4, R-1, S-2

D) P-4, Q-3, R-2, S-1

Explanation:

PSEN (Program Store Enable): Used to read external program memory.

EA (External Access): Determines whether to use internal or external program memory.

ALE (Address Latch Enable): Used to demultiplex the address-data bus.

XTAL1/XTAL2: Connections for the external oscillator.

Q3. In 8051 microcontroller schematics, what does the symbol 'EA' represent?

A) External Address

B) External Access

C) Enable Access

D) External Acknowledge

Explanation:

A) External Address: Incorrect. 'EA' does not stand for External Address.

B) External Access: Correct. 'EA' pin determines the use of internal or external program memory.

C) Enable Access: Incorrect. Not the standard terminology.

D) External Acknowledge: Incorrect. Not related to 'EA' in 8051.

Q4. Which port of the 8051 microcontroller is used for both address and data?

A) Port 0

B) Port 1

C) Port 2

D) Port 3

Explanation:

A) Port 0: Correct. It serves as a multiplexed address/data bus.

B) Port 1: Incorrect. General-purpose I/O.

C) Port 2: Incorrect. Used for higher-order address byte.

D) Port 3: Incorrect. Used for special functions.

Q5. Which of the following is not associated with the 8051 microcontroller?

A) Harvard Architecture

B) 16-bit Data Bus

C) On-chip ROM

D) Serial Communication

Explanation:

A) Harvard Architecture: Associated. 8051 uses separate memory spaces for program and data.

B) 16-bit Data Bus: Not associated. 8051 has an 8-bit data bus.

C) On-chip ROM: Associated. 8051 includes on-chip program memory.

D) Serial Communication: Associated. 8051 supports serial communication via UART.

Q6. Which of the following is not considered a feature of the 8051 microcontrollers?

A) Four parallel I/O ports

B) Two 16-bit timers

C) 16-bit data bus

D) On-chip oscillator

Explanation:

A) Four parallel I/O ports: Considered. 8051 has Ports 0 to 3.

B) Two 16-bit timers: Considered. Timer 0 and Timer 1 are 16-bit.

C) 16-bit data bus: Not considered. 8051 has an 8-bit data bus.

D) On-chip oscillator: Considered. 8051 includes an on-chip oscillator.

Q7. What is the total number of interrupt sources in the 8051 microcontroller?

A) 2

B) 3

C) 5

D) 6

Explanation:

A) 2: Incorrect. 8051 has more interrupt sources.

B) 3: Incorrect. Understates the number.

C) 5: Correct. Two external interrupts, two timer interrupts, and one serial port interrupt.

D) 6: Incorrect. Overstates the number.

Q8. If the 8051 microcontroller needs to interface with an external memory, which pin should be set low?

A) EA

B) PSEN

C) ALE

D) RST

Explanation:

A) EA: Correct. Setting EA low enables external program memory access.

B) PSEN: Incorrect. Used to read external program memory but doesn't control access.

C) ALE: Incorrect. Used for address/data demultiplexing.

D) RST: Incorrect. Used to reset the microcontroller.

Q9. If the 8051 microcontroller operates at 12 MHz, what is the machine cycle frequency?

A) 12 MHz

B) 3 MHz

C) 1 MHz

D) 6 MHz

Q10. Which of the following ports in 8051 is only used for I/O and not for any alternate functions?

A) Port 0

B) Port 1

C) Port 2

D) Port 3

Explanation:

A) Port 0 is multiplexed with address/data.

B) Correct. Port 1 is used only as I/O.

C) Port 2 is used for higher address lines.

D) Port 3 is used for special functions like interrupts, serial I/O, etc.

Q11. If a timer is set in mode 1 (16-bit) and clock is 12 MHz, how many microseconds does it take for one overflow?

A) 655.36 µs

B) 13.12 µs

C) 1092 µs

D) 54.25 µs

Explanation:

Timer in mode 1 overflows after 65536 counts

One count = 1 µs (12 MHz / 12 = 1 MHz → 1 µs)

Time = 65536 × 1 µs = 65536 µs = 65.536 ms

Q12. What is the unit of baud rate in serial communication?

A) Volts

B) Bits/sec

C) Bytes/sec

D) Hertz

Explanation:

A) Incorrect. Volts is for voltage.

B) Correct. Baud rate = number of bits per second.

C) Bytes/sec = 8×bits/sec.

D) Hertz is frequency, not data rate.

Q13. What is a machine cycle in 8051?

A) One clock pulse

B) Four clock pulses

C) Six clock pulses

D) Twelve clock pulses

Explanation: 8051 uses 12 oscillator periods (clock pulses) for one machine cycle.

Q14. Which condition must be met for external memory access in 8051?

A) EA pin is high

B) EA pin is low

C) PSEN is low

D) ALE is high

Explanation:

EA = 0 → external memory access

EA = 1 → internal memory used

Q15. If 8051 is connected to an 11.0592 MHz crystal, what is the serial baud rate with TH1 = FDH?

A) 2400

B) 4800

C) 9600

D) 19200

Explanation:

Baud Rate = (2^SMOD / 32) × (Timer 1 Overflow Rate)

With TH1 = FDH, Timer reload = 253

Baud rate ≈ 9600 bps

16. Match the Following (Formulas, Theory, Authors)

List I	List II
A. RISC	1. Fewer instructions
B. CISC	2. Complex instructions
C. Von Neumann	3. Shared memory for data/code
D. Harvard	4. Separate memory for data/code

A. - A → 1 - B → 2 - C → 3 - D → 4

B. - A → 2 - B → 1 - C → 3 - D → 4

C. - A → 1 - B → 2 - C → 4 - D → 3

D. - A → 2 - B → 1 - C → 4 - D → 3

Q17. Which statement is incorrect about 8051?

A) It has two 16-bit timers

B) It has 8-bit ALU

C) Port 0 needs pull-up resistors

D) PSEN is used to write to external memory

Explanation: D is wrong → PSEN is used to read from external program memory, not write.

Q18. How is the timer overflow time calculated?

A) Timer counts × oscillator frequency

B) Oscillator frequency × 12

C) Timer counts / (oscillator / 12)

D) Timer counts / oscillator frequency

Q19. Timer 1 is in Mode 1 with TH1 = 0xF8, TL1 = 0x30. Oscillator = 12 MHz. What is delay?

A) 100 µs

B) 150 µs

C) 500 µs

D) 200 µs

Explanation:

Counts = 65536 - (F830H = 63536) = 2000

1 count = 1 µs ⇒ 2000 × 1 µs = 2000 µs

Q20. What does 'RST' pin in 8051 represent?

A) Read/Store Terminal

B) Reset

C) Restart Signal Terminal

D) Register Set Terminal

Explanation: RST is the Reset pin. A high on this pin resets the microcontroller.

Unit IX: A. Power Electronics and Drives

Thyristor family

1: Which of the following devices is a member of the thyristor family?

A) MOSFET

B) IGBT

C) GTO

D) BJT

2: The holding current (I_H) of a thyristor is:

A) The minimum current required to turn on the device.

B) The maximum current the device can handle.

C) The minimum current required to keep the device conducting.

D) The current at which the device turns off.

3: What is the unit of the rate of rise of current (di/dt) in a thyristor?

A) A/s

B) V/s

C) Ω/s

D) W/s

4: A thyristor is best defined as:

A) A unidirectional, three-terminal device with regenerative feedback.

B) A bidirectional, two-terminal device without control.

C) A unidirectional, two-terminal device with linear characteristics.

D) A bidirectional, three-terminal device with no feedback.

5: A thyristor remains in the conducting state until:

A) The gate signal is removed.

B) The anode current falls below the holding current.

C) The supply voltage is increased.

D) The cathode is made positive with respect to the anode.

6: Assume the SCR is triggered but load current is below the holding current. What happens?

A) SCR latches ON

B) SCR stays OFF

C) SCR turns ON briefly

D) SCR starts oscillating

7. [Match the Following: Theory]

List I	List II
A. TRIAC	1. Bidirectional thyristor
B. LASCR	2. Light activated SCR
C. DIAC	3. Bidirectional diode
D. GTO	4. Gate Turn-Off thyristor

A–1 B–2 C–3 D–4

A–2 B–3 C–4 D–1

A–3 B–2 C–1 D–4

A–4 B–3 C–2 D–1

8: Which of the following about thyristors is wrong?

A) They are used for AC power control

B) They can be turned off by gate signal

C) They have latching characteristics

D) They conduct after being forward biased and triggered

9: The symbol of a TRIAC shows:

A) One junction

B) Three terminals, two arrows

C) Bidirectional control

D) Diode with gate

10: Which thyristor is used for fast switching applications?

A) LASCR

B) SCR

C) GTO

D) MOS Controlled Thyristor

11: If latching current = 30 mA, and initial current is 25 mA, SCR will:

A) Turn ON

B) Stay OFF

C) Partially turn ON

D) Show hysteresis

12: dv/dt rating is expressed in:

A) V/s

B) kW

C) A/s

D) V/µs

13: DIAC is:

A) Unidirectional switch

B) Bidirectional trigger device

C) Light-sensitive thyristor

D) Power diode

14: A 100V, 50Ω load is connected through SCR. Triggered ON. What is the current?

A) 2 A

B) 1 A

C) 0.5 A

D) 5 A

15: What is the purpose of snubber circuit in thyristors?

A) Heat dissipation

B) Limit di/dt only

C) Reduce noise

D) Limit dv/dt

16: Thyristors are widely used in:

A) SMPS

B) Audio amplifiers

C) Inverter circuits

D) DC measurement systems

17: If V = 230 V, R = 115 Ω, what is anode current through SCR when ON?

A) 1 A

B) 2 A

C) 0.5 A

D) 5 A

18: SCR false triggering due to high dv/dt can be avoided using:

A) Fuse

B) Snubber

C) Filter

D) Diode clamp

19: GTO is also called as:

A) Reverse conducting SCR

B) Fast recovery SCR

C) Gate turn-off SCR

D) Silicon trigger switch

20: Which is not an advantage of SCR?

A) High power handling

B) Triggered by light

C) Small in size

D) Low conduction loss

Unit IX: A. Power Electronics and Drives

Thyristor family

1: Which of the following devices is a member of the thyristor family?

A) MOSFET

B) IGBT

C) GTO

D) BJT

Explanation:

A) MOSFET: A Metal-Oxide-Semiconductor Field-Effect Transistor, not part of the thyristor family.

B) IGBT: Insulated Gate Bipolar Transistor, combines features of BJT and MOSFET, not a thyristor.

C) GTO: Gate Turn-Off thyristor, a type of thyristor that can be turned off via the gate terminal.

D) BJT: Bipolar Junction Transistor, not a thyristor.

2: The holding current (I_H) of a thyristor is:

A) The minimum current required to turn on the device.

B) The maximum current the device can handle.

C) The minimum current required to keep the device conducting.

D) The current at which the device turns off.

Explanation:

A) Describes the latching current, not the holding current.

B) Refers to the maximum rated current, not the holding current.

C) Correct; holding current is the minimum anode current below which the thyristor turns off.

D) While related, the device turns off when current falls below the holding current.

3: What is the unit of the rate of rise of current (di/dt) in a thyristor?

A) A/s

B) V/s

C) Ω/s

D) W/s

Explanation:

A) Correct; di/dt represents the rate of change of current over time, measured in amperes per second.

B) Volts per second, relates to dv/dt, not di/dt.

C) Ohms per second, not applicable here.

D) Watts per second, relates to power change, not current change.

4: A thyristor is best defined as:

A) A unidirectional, three-terminal device with regenerative feedback.

B) A bidirectional, two-terminal device without control.

C) A unidirectional, two-terminal device with linear characteristics.

D) A bidirectional, three-terminal device with no feedback.

Explanation:

A) Correct; thyristors conduct in one direction and have three terminals: anode, cathode, and gate.

B) Describes a diode, not a thyristor.

C) Thyristors are non-linear devices.

D) Describes a TRIAC, which is bidirectional.

5: A thyristor remains in the conducting state until:

A) The gate signal is removed.

B) The anode current falls below the holding current.

C) The supply voltage is increased.

D) The cathode is made positive with respect to the anode.

Explanation:

A) Once triggered, the gate signal is no longer needed to maintain conduction.

B) Correct; the thyristor turns off when anode current drops below the holding current.

C) Increasing supply voltage does not turn off the thyristor.

D) Reversing polarity may turn off the device, but the key condition is the anode current falling below holding current.

6: Assume the SCR is triggered but load current is below the holding current. What happens?

A) SCR latches ON

B) SCR stays OFF

C) SCR turns ON briefly

D) SCR starts oscillating

Explanation:

A) It won't latch without sufficient current.

B) Correct; SCR stays OFF if current < holding current.

C) It won't turn ON even briefly.

D) SCRs are not oscillators.

7. [Match the Following: Theory]

List I	List II
A. TRIAC	1. Bidirectional thyristor
B. LASCR	2. Light activated SCR
C. DIAC	3. Bidirectional diode
D. GTO	4. Gate Turn-Off thyristor

A–1 B–2 C–3 D–4

A–2 B–3 C–4 D–1

A–3 B–2 C–1 D–4

A–4 B–3 C–2 D–1

8: Which of the following about thyristors is wrong?

A) They are used for AC power control

B) They can be turned off by gate signal

C) They have latching characteristics

D) They conduct after being forward biased and triggered

Explanation: Only GTO allows gate turn-off. Normal SCRs can't.

9: The symbol of a TRIAC shows:

A) One junction

B) Three terminals, two arrows

C) Bidirectional control

D) Diode with gate

Explanation: A TRIAC conducts in both directions and has gate control.

10: Which thyristor is used for fast switching applications?

A) LASCR

B) SCR

C) GTO

D) MOS Controlled Thyristor

Explanation: MCTs allow fast switching via MOS gate control.

11: If latching current = 30 mA, and initial current is 25 mA, SCR will:

A) Turn ON

B) Stay OFF

C) Partially turn ON

D) Show hysteresis

Explanation: Latching current not reached → SCR won't turn ON.

12: dv/dt rating is expressed in:

A) V/s

B) kW

C) A/s

D) V/μs

Explanation: It defines how fast voltage can rise before false triggering.

13: DIAC is:

A) Unidirectional switch

B) Bidirectional trigger device

C) Light-sensitive thyristor

D) Power diode

14: A 100V, 50Ω load is connected through SCR. Triggered ON. What is the current?

A) 2 A

B) 1 A

C) 0.5 A

D) 5 A

Explanation: I = V/R = 100/50 = 2 A

15: What is the purpose of snubber circuit in thyristors?

A) Heat dissipation

B) Limit di/dt only

C) Reduce noise

D) Limit dv/dt

16: Thyristors are widely used in:

A) SMPS

B) Audio amplifiers

C) Inverter circuits

D) DC measurement systems

17: If V = 230 V, R = 115 Ω, what is anode current through SCR when ON?

A) 1 A

B) 2 A

C) 0.5 A

D) 5 A

Explanation: I = V/R = 230/115 = 2 A

18: SCR false triggering due to high dv/dt can be avoided using:

A) Fuse

B) Snubber

C) Filter

D) Diode clamp

19: GTO is also called as:

A) Reverse conducting SCR

B) Fast recovery SCR

C) Gate turn-off SCR

D) Silicon trigger switch

20: Which is not an advantage of SCR?

A) High power handling

B) Triggered by light

C) Small in size

D) Low conduction loss

Explanation: Only LASCRs are light-triggered; standard SCRs require gate pulse.

Unit X: Control of Electrical Machines

Control Circuit Components [Switches, Relays, Timers, Contactors]

1. Which of the following is a characteristic of a latching relay?

A) Requires continuous power to maintain its state

B) Returns to its default state when power is removed

C) Maintains its state without continuous power

D) Operates only with AC supply

2. Match the following (List I - Unit Based) with List II:

List I:	List II:
a) Relay	1) High-current control
b) Contactor	2) Time delay operation
c) Timer	3) Manual circuit control
d) Switch	4) Low-power signal control

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

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

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

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

3. Which symbol represents a normally closed contact in electrical schematics?

A) ¬| |¬

B) ¬| / |¬

C) ¬| — |¬

D) ¬| └ |¬

4. Select the correct statement about contactors:

A) Contactors are used for low-current applications only

B) Contactors cannot be operated remotely

C) Contactors are suitable for switching high-power loads

D) Contactors are the same as circuit breakers

5. Which of the following is NOT associated with a timer relay?

A) Delay-on-make function

B) Delay-on-break function

C) Instantaneous operation

D) Overcurrent protection

6. Which of the following is NOT considered when selecting a relay for a specific application?

A) Coil voltage

B) Contact configuration

C) Physical size

D) Ambient temperature

7. Calculate the total resistance in a circuit where a relay coil of 200 ohms is connected in series with a switch having negligible resistance.

A) 0 ohms

B) 200 ohms

C) 100 ohms

D) 400 ohms

8. Determine the time delay introduced by a timer set to delay-on-make for 5 seconds in a control circuit.

A) The circuit energizes immediately

B) The circuit energizes after 5 seconds

C) The circuit de-energizes after 5 seconds

D) The circuit never energizes

9. A contactor is rated for 400V and 50A. What is the maximum power it can handle?

A) 20,000 W

B) 2,000 W

C) 200 W

D) 8,000 W

10. In a control circuit, a relay operates with a coil voltage of 24V DC and controls a 230V AC load. What is the purpose of using such a relay?

A) To step down the voltage

B) To isolate control and load circuits

C) To convert DC to AC

D) To increase current flow

11. Which characteristic differentiates a contactor from a relay?

A) Contactors are used for low-current applications

B) Relays are designed for high-power switching

C) Contactors have arc suppression features for high-current switching

D) Relays cannot be used in control circuits

12. Match the following (List I - Component) with List II (Function):

List I: **List II:**

a) SPST Switch **1) Controls high-current loads**

b) DPDT Relay 2) Provides time delay operations

c) Timer 3) Simple on/off control

d) Contactor 4) Changes connections between two circuits

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

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

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

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

13. Which of the following is the correct characteristic of a bimetallic overload relay?

A) It responds instantly to overcurrent.

B) It operates on the principle of magnetic field.

C) It provides thermal protection by time-delayed tripping.

D) It is used for voltage regulation.

14. Select the correct statement about timers in control circuits:

A) Timers are used to protect circuits from overcurrent.

B) Timers can only be used with AC circuits.

C) Timers provide time delay functions in control circuits.

D) Timers are used to increase the voltage in a circuit.

15. Which of the following is NOT associated with a contactor?

A) Arc suppression

B) High-current switching

C) Manual operation

D) Control of electric motors

16. Which of the following is NOT considered when selecting a timer for a control circuit?

A) Time delay range

B) Operating voltage

C) Physical color

D) Contact configuration

17. Calculate the power consumed by a relay coil rated at 24V DC and 0.1A.

A) 2.4 W

B) 24 W

C) 0.24 W

D) 240 W

18. A timer is set to delay-on-make with a 10-second delay. What happens when the control voltage is applied?

A) The output is energized immediately.

B) The output is energized after 10 seconds.

C) The output is de-energized after 10 seconds.

D) The timer does not respond.

19. A contactor coil operates at 230V AC and draws 0.2A. What is the power consumption of the coil?

A) 46 W

B) 4.6 W

C) 0.046 W

D) 460 W

20. In a control circuit, a relay with a normally closed contact is used to control a lamp. What happens to the lamp when the relay coil is energized?

A) The lamp turns on.

B) The lamp turns off.

C) The lamp flickers.

D) The lamp remains unaffected.

Unit X: Control of Electrical Machines

Control Circuit Components [Switches, Relays, Timers, Contactors]

1. Which of the following is a characteristic of a latching relay?

A) Requires continuous power to maintain its state

B) Returns to its default state when power is removed

C) Maintains its state without continuous power

D) Operates only with AC supply

Explanation: Latching relays retain their last position without continuous power, making them energy-efficient for certain applications. [1]

2. Match the following (List I - Unit Based) with List II:

List I:	List II:
a) Relay	1) High-current control
b) Contactor	2) Time delay operation
c) Timer	3) Manual circuit control
d) Switch	4) Low-power signal control

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

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

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

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

Explanation:

Relay: Controls circuits using low-power signals

Contractor: Handles high-current loads

Timer: Provides time delay operations

Switch: Manually opens or closes circuits

3. Which symbol represents a normally closed contact in electrical schematics?

A) ⊣ ⊢

B) ⊣/⊢

C) ⊣–⊢

D) ⊣└⊢

Explanation: The symbol with a line intersecting the contact line represents a normally closed contact, indicating the circuit is closed when the relay is not energized.

4. Select the correct statement about contactors:

A) Contactors are used for low-current applications only

B) Contactors cannot be operated remotely

C) Contactors are suitable for switching high-power loads

D) Contactors are the same as circuit breakers

Explanation: Contactors are designed to control high-current devices like motors and lighting systems. [2]

5. Which of the following is NOT associated with a timer relay?

A) Delay-on-make function

B) Delay-on-break function

C) Instantaneous operation

D) Overcurrent protection

Explanation: Timer relays are used for controlling time-based operations, not for overcurrent protection, which is handled by protective relays.

6. Which of the following is NOT considered when selecting a relay for a specific application?

A) Coil voltage

B) Contact configuration

C) Physical size

D) Ambient temperature

Explanation: While physical size may be a factor, the primary considerations are electrical characteristics like coil voltage, contact configuration, and environmental conditions.

7. Calculate the total resistance in a circuit where a relay coil of 200 ohms is connected in series with a switch having negligible resistance.

A) 0 ohms

B) 200 ohms

C) 100 ohms

D) 400 ohms

Explanation: The switch has negligible resistance, so the total resistance is that of the relay coil alone, which is 200 ohms.

8. Determine the time delay introduced by a timer set to delay-on-make for 5 seconds in a control circuit.

A) The circuit energizes immediately

B) The circuit energizes after 5 seconds

C) The circuit de-energizes after 5 seconds

D) The circuit never energizes

Explanation: A delay-on-make timer waits for the set time (5 seconds) before closing the contacts to energize the circuit.

9. A contactor is rated for 400V and 50A. What is the maximum power it can handle?

A) 20,000 W

B) 2,000 W

C) 200 W

D) 8,000 W

Explanation: Power = Voltage × Current = 400V × 50A = 20,000 W

10. In a control circuit, a relay operates with a coil voltage of 24V DC and controls a 230V AC load. What is the purpose of using such a relay?

A) To step down the voltage

B) To isolate control and load circuits

C) To convert DC to AC

D) To increase current flow

Explanation: Relays allow a low-voltage control circuit to switch a high-voltage load, providing electrical isolation between the two.

11. Which characteristic differentiates a contactor from a relay?

A) Contactors are used for low-current applications

B) Relays are designed for high-power switching

C) Contactors have arc suppression features for high-current switching

D) Relays cannot be used in control circuits

Explanation: Contactors are equipped to handle high currents and include features to suppress arcing during operation. [2]

12. Match the following (List I - Component) with List II (Function):

List I:	List II:
a) SPST Switch	1) Controls high-current loads
b) DPDT Relay	2) Provides time delay operations

c) Timer **3) Simple on/off control**

d) Contactor **4) Changes connections between two circuits**

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

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

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

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

Explanation:

SPST Switch: Provides simple on/off control.

DPDT Relay: Can change connections between two circuits.

Timer: Provides time delay operations.

Contactor: Controls high-current loads.

13. Which of the following is the correct characteristic of a bimetallic overload relay?

A) It responds instantly to overcurrent.

B) It operates on the principle of magnetic field.

C) It provides thermal protection by time-delayed tripping.

D) It is used for voltage regulation.

Explanation: A bimetallic overload relay works based on the heating effect of current. It uses two metals with different expansion rates; when excessive current flows, the metals bend and trip the circuit with a time delay, protecting motors from overheating.

14. Select the correct statement about timers in control circuits:

A) Timers are used to protect circuits from overcurrent.

B) Timers can only be used with AC circuits.

C) Timers provide time delay functions in control circuits.

D) Timers are used to increase the voltage in a circuit.

Explanation: Timers are used to introduce delays in control circuits, allowing for operations like delayed start or stop. [2]

15. Which of the following is NOT associated with a contactor?

A) Arc suppression

B) High-current switching

C) Manual operation

D) Control of electric motors

Explanation: Contactors are electrically operated switches designed for high-current applications and are not manually operated. [3]

16. Which of the following is NOT considered when selecting a timer for a control circuit?

A) Time delay range

B) Operating voltage

C) Physical color

D) Contact configuration

Explanation: The color of a timer is not a functional parameter and is typically not considered during selection.

17. Calculate the power consumed by a relay coil rated at 24V DC and 0.1A.

A) 2.4 W

B) 24 W

C) 0.24 W

D) 240 W

Explanation: Power (P) = Voltage (V) × Current (I) = 24V × 0.1A = 2.4 W.

18. A timer is set to delay-on-make with a 10-second delay. What happens when the control voltage is applied?

A) The output is energized immediately.

B) The output is energized after 10 seconds.

C) The output is de-energized after 10 seconds.

D) The timer does not respond.

Explanation: In a delay-on-make timer, the output is energized after the preset delay once the control voltage is applied. [2]

19. A contactor coil operates at 230V AC and draws 0.2A. What is the power consumption of the coil?

A) 46 W

B) 4.6 W

C) 0.046 W

D) 460 W

Explanation: Power (P) = Voltage (V) × Current (I) = 230V × 0.2A = 46 W.

20. In a control circuit, a relay with a normally closed contact is used to control a lamp. What happens to the lamp when the relay coil is energized?

A) The lamp turns on.

B) The lamp turns off.

C) The lamp flickers.

D) The lamp remains unaffected.

Explanation: Energizing the relay coil opens the normally closed contact, interrupting the circuit and turning off the lamp