

Technical Abilities (Electrical): 100 MCQs

- Target Exam: RRB Junior Engineer (RRB JE)
- Study Notes Prepared for: Entri App Users

Section 1: Basic DC & Circuit Fundamentals (Q1–Q25)

Q1. What is the SI unit of electric current?

- A) Volt
- B) Ampere
- C) Ohm
- D) Watt

Answer: B

Q2. According to Ohm's law, current is directly proportional to:

- A) Resistance
- B) Capacitance
- C) Voltage
- D) Power

Answer: C

Q3. The unit of electrical resistance is:

- A) Siemens
- B) Henry
- C) Farad
- D) Ohm

Answer: D

Q4. Conductance is the reciprocal of:

- A) Resistance
- B) Voltage

- C) Current
- D) Inductance

Answer: A

Q5. What is the unit of electrical conductance?

- A) Ohm
- B) Siemens (or Mho)
- C) Coulomb
- D) Weber

Answer: B

Q6. Kirchhoff's Current Law (KCL) is based on the conservation of:

- A) Energy
- B) Charge
- C) Momentum
- D) Mass

Answer: B

Q7. Kirchhoff's Voltage Law (KVL) is based on the conservation of:

- A) Charge
- B) Energy
- C) Power
- D) Flux

Answer: B

Q8. Two 10Ω resistors connected in series yield an equivalent resistance of:

- A) 5Ω
- B) 10Ω

C) 20Ω

D) 100Ω

Answer: C

Q9. Two 10Ω resistors connected in parallel yield an equivalent resistance of:

A) 5Ω

B) 10Ω

C) 20Ω

D) 2.5Ω

Answer: A

Q10. Electrical power P in a DC circuit can be calculated using:

A) $P = V \times I$

B) $P = I^2 \times R$

C) $P = \frac{V^2}{R}$

D) All of the above

Answer: D

Q11. Ideal voltage sources have:

A) Infinite internal resistance

B) Zero internal resistance

C) 100Ω internal resistance

D) Variable resistance

Answer: B

Q12. Ideal current sources have:

A) Zero internal resistance

B) Infinite internal resistance

- C) 1Ω internal resistance
- D) Negative resistance

Answer: B

Q13. Superposition theorem is applicable only to:

- A) Non-linear circuits
- B) Linear bilateral circuits
- C) Digital circuits
- D) Magnetic circuits

Answer: B

Q14. According to Thevenin's theorem, any linear circuit can be replaced by:

- A) Current source in parallel with resistance
- B) Voltage source in series with resistance
- C) Voltage source in parallel with resistance
- D) Ideal current source only

Answer: B

Q15. According to Norton's theorem, any linear circuit can be replaced by:

- A) Current source in parallel with resistance
- B) Voltage source in series with resistance
- C) Voltage source in parallel with resistance
- D) Ideal voltage source only

Answer: A

Q16. Maximum power transfer theorem states that max power is delivered when load resistance equals:

- A) Half the source resistance
- B) Thevenin source resistance

- C) Double the source resistance
- D) Zero

Answer: B

Q17. The power factor of a purely resistive DC circuit is:

- A) 0
- B) 0.5
- C) 1
- D) Infinity

Answer: C

Q18. The energy stored in an inductor is given by:

- A) $E = \frac{1}{2} CV^2$
- B) $E = \frac{1}{2} LI^2$
- C) $E = LI$
- D) $E = VIt$

Answer: B

Q19. The energy stored in a capacitor is given by:

- A) $E = \frac{1}{2} CV^2$
- B) $E = \frac{1}{2} LI^2$
- C) $E = CV$
- D) $E = \frac{V^2}{R}$

Answer: A

Q20. An open circuit has:

- A) Zero resistance and infinite current

- B) Infinite resistance and zero current
- C) Zero resistance and zero current
- D) Infinite resistance and infinite current

Answer: B

Q21. A short circuit has:

- A) Zero resistance and maximum current
- B) Infinite resistance and zero current
- C) Zero current and zero voltage
- D) Infinite resistance and maximum current

Answer: A

Q22. The resistivity of a conductor depends on its:

- A) Length
- B) Cross-sectional area
- C) Material and temperature
- D) Shape

Answer: C

Q23. Temperature coefficient of resistance for metals is generally:

- A) Positive
- B) Negative
- C) Zero
- D) Infinite

Answer: A

Q24. Temperature coefficient of resistance for semiconductors is generally:

- A) Positive

- B) Negative
- C) Zero
- D) Variable

Answer: B

Q25. Which device measures electrical current in a branch?

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

Answer: B

Section 2: AC Circuits & Phasors (Q26–Q50)

Q26. What is the frequency of standard household AC supply in North America?

- A) 50 Hz
- B) 60 Hz
- C) 100 Hz
- D) 120 Hz

Answer: B

Q27. The Form Factor of a pure sine wave is:

- A) 1.00
- B) 1.11
- C) 1.414
- D) 0.707

Answer: B

Q28. The Peak (Crest) Factor of a pure sine wave is:

- A) 1.11

B) 1.414

C) 2.0

D) 0.707

Answer: B

Q29. For a sinusoidal AC wave, RMS voltage is equal to:

A) $0.707 \times V_{peak}$

B) $0.637 \times V_{peak}$

C) $1.414 \times V_{peak}$

D) $2 \times V_{peak}$

Answer: A

Q30. For a sinusoidal AC wave, Average voltage is equal to:

A) $0.707 \times V_{peak}$

B) $0.637 \times V_{peak}$

C) $1.11 \times V_{peak}$

D) V_{peak}

Answer: B

Q31. In a purely capacitive AC circuit, current:

A) Lags voltage by 90°

B) Leads voltage by 90°

C) Is in phase with voltage

D) Leads voltage by 180°

Answer: B

Q32. In a purely inductive AC circuit, current:

A) Lags voltage by 90°

- B) Leads voltage by 90°
- C) Is in phase with voltage
- D) Lags voltage by 45°

Answer: A

Q33. Inductive Reactance (X_L) is calculated as:

- A) $\frac{1}{2\pi fL}$
- B) $2\pi fL$
- C) $2\pi fC$
- D) $\frac{L}{C}$

Answer: B

Q34. Capacitive Reactance (X_C) is calculated as:

- A) $2\pi fC$
- B) $\frac{1}{2\pi fC}$
- C) $\frac{1}{2\pi fL}$
- D) $2\pi fL$

Answer: B

Q35. As frequency increases, capacitive reactance:

- A) Increases
- B) Decreases
- C) Remains unchanged
- D) Becomes zero immediately

Answer: B

Q36. As frequency increases, inductive reactance:

- A) Increases
- B) Decreases
- C) Remains unchanged
- D) Oscillates

Answer: A

Q37. Impedance (Z) of a series RLC circuit is:

- A) $R + X_L + X_C$
- B) $\sqrt{R^2 + (X_L - X_C)^2}$
- C) $\sqrt{R + X_L - X_C}$
- D) $R^2 + (X_L - X_C)^2$

Answer: B

Q38. At series resonance, the total impedance of an RLC circuit is:

- A) Maximum and equal to R
- B) Minimum and equal to R
- C) Zero
- D) Infinite

Answer: B

Q39. The resonant frequency f_0 of a series RLC circuit is:

- A) $\frac{1}{2\pi\sqrt{LC}}$
- B) $2\pi\sqrt{LC}$
- C) $\frac{1}{2\pi LC}$
- D) $\sqrt{LC}$

Answer: A

Q40. Power Factor is defined as the ratio of:

- A) Apparent Power to Real Power
- B) Real Power to Apparent Power
- C) Reactive Power to Real Power
- D) Apparent Power to Reactive Power

Answer: B

Q41. Unit of Real (Active) Power is:

- A) VAR
- B) VA
- C) Watt (or kW)
- D) Joule

Answer: C

Q42. Unit of Reactive Power is:

- A) Watt
- B) Volt-Ampere Reactive (VAR)
- C) Volt-Ampere (VA)
- D) Ohm

Answer: B

Q43. Unit of Apparent Power is:

- A) Watt
- B) VAR
- C) Volt-Ampere (VA)
- D) Coulomb

Answer: C

Q44. In a 3-phase star (Y) connection:

- A) Line Voltage = Phase Voltage
- B) Line Voltage = $\sqrt{3} \times$ Phase Voltage
- C) Line Current = $\sqrt{3} \times$ Phase Current
- D) Line Voltage = $3 \times$ Phase Voltage

Answer: B

Q45. In a 3-phase delta (Δ) connection:

- A) Line Voltage = Phase Voltage
- B) Line Current = Phase Current
- C) Line Voltage = $\sqrt{3} \times$ Phase Voltage
- D) Line Voltage = 0

Answer: A

Q46. Total active power in a balanced 3-phase system is:

- A) $V_L I_L \cos \theta$
- B) $\sqrt{3} V_L I_L \cos \theta$
- C) $3 V_L I_L \cos \theta$
- D) $\sqrt{3} V_L I_L \sin \theta$

Answer: B

Q47. Capacitors are added in industrial systems to:

- A) Increase inductive load
- B) Improve power factor
- C) Decrease system frequency
- D) Convert AC to DC

Answer: B

Q48. In a 3-phase system, the phase angle difference between phases is:

- A) 90°
- B) 120°
- C) 180°
- D) 360°

Answer: B

Q49. A skin effect in AC conductors causes current to flow primarily:

- A) In the core center
- B) Near the outer surface
- C) Uniformly throughout
- D) In a zigzag path

Answer: B

Q50. Skin effect increases with:

- A) Lower frequency
- B) Higher frequency and larger diameter
- C) Decreased conductor diameter
- D) DC current

Answer: B

Section 3: Electrical Machines & Transformers (Q51–Q75)

Q51. Transformers operate on the principle of:

- A) Self induction only
- B) Mutual electromagnetic induction
- C) Electrostatic attraction
- D) Seebeck effect

Answer: B

Q52. Transformers work on:

- A) AC only
- B) DC only
- C) Both AC and DC
- D) Pulsating DC only

Answer: A

Q53. Transformer core laminations are used to reduce:

- A) Copper loss
- B) Hysteresis loss
- C) Eddy current loss
- D) Stray loss

Answer: C

Q54. The turns ratio of a transformer is given by:

- A) $\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{I_2}{I_1}$
- B) $\frac{N_1}{N_2} = \frac{V_2}{V_1}$
- C) $\frac{N_1}{N_2} = \frac{I_1}{I_2}$
- D) $\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{I_1}{I_2}$

Answer: A

Q55. Open-circuit test on a transformer determines:

- A) Copper loss
- B) Core (iron) loss
- C) Friction loss
- D) Total full-load loss

Answer: B

Q56. Short-circuit test on a transformer determines:

- A) Core loss
- B) Copper loss at full load
- C) Stray losses
- D) Insulation resistance

Answer: B

Q57. In an ideal transformer, efficiency is:

- A) 80%
- B) 90%
- C) 100%
- D) 50%

Answer: C

Q58. DC Generators operate on the principle of:

- A) Faraday's law of electromagnetic induction
- B) Ampere's Law
- C) Lenz's Law
- D) Joule's Law

Answer: A

Q59. The component in a DC generator that converts AC generated in armature to DC is:

- A) Slip rings
- B) Commutator
- C) Brushes
- D) Stator

Answer: B

Q60. Slip rings are used in:

- A) DC Generators
- B) AC Alternators / Induction Motors
- C) DC Shunt Motors
- D) Stepper Motors

Answer: B

Q61. Back EMF in a DC motor:

- A) Aids applied voltage
- B) Opposes applied voltage
- C) Increases magnetic flux
- D) Equals zero at full speed

Answer: B

Q62. The speed of a DC shunt motor can be controlled by:

- A) Armature voltage control
- B) Field flux control
- C) Adding resistance in armature circuit
- D) All of the above

Answer: D

Q63. Which DC motor provides the highest starting torque?

- A) Shunt motor
- B) Series motor
- C) Cumulative compound motor
- D) Differential compound motor

Answer: B

Q64. A DC series motor should never be started:

- A) On full load
- B) Without load (at no-load)
- C) With field resistance added
- D) At reduced voltage

Answer: B

Q65. Synchronous speed (N_s) of an AC motor is given by:

- A) $\frac{120f}{P}$
- B) $\frac{120P}{f}$
- C) $\frac{60f}{P}$
- D) $120fP$

Answer: A

Q66. The difference between synchronous speed and actual rotor speed in an induction motor is called:

- A) Phase shift
- B) Slip
- C) Skew
- D) Backlash

Answer: B

Q67. Slip (s) in an induction motor is expressed as:

- A) $\frac{N_s - N}{N_s}$
- B) $\frac{N - N_s}{N}$

C) $\frac{N_s}{N}$

D) $\frac{N}{N_s - N}$

Answer: A

Q68. At standstill, the slip of an induction motor is:

A) 0

B) 0.5

C) 1

D) Infinite

Answer: C

Q69. If an induction motor runs at synchronous speed, the slip becomes:

A) 1

B) 0

C) -1

D) Infinity

Answer: B

Q70. Synchronous motors run at:

A) Less than synchronous speed

B) Synchronous speed at all loads

C) Greater than synchronous speed

D) Variable speeds

Answer: B

Q71. A synchronous motor can operate at:

A) Lagging power factor only

B) Leading power factor only

- C) Unity power factor only
- D) Lagging, leading, or unity power factor

Answer: D

Q72. An over-excited synchronous motor running at no load acts as a:

- A) Synchronous condenser (improves PF)
- B) Inductor
- C) Resistor
- D) DC generator

Answer: A

Q73. The function of a Buchholz relay in a transformer is to protect against:

- A) Overvoltage
- B) Internal fault (gas-actuated)
- C) Earth fault outside tank
- D) Reverse current

Answer: B

Q74. Transformer oil provides:

- A) Insulation only
- B) Cooling only
- C) Both insulation and cooling
- D) Lubrication to windings

Answer: C

Q75. High-frequency transformers generally use cores made of:

- A) Laminated iron
- B) Ferrite

- C) Cast steel
- D) Copper

Answer: B

Section 4: Power Systems, Measurements & Safety (Q76–Q100)

Q76. Which plant has the highest initial setup cost?

- A) Thermal power plant
- B) Hydroelectric power plant / Nuclear
- C) Diesel power plant
- D) Gas turbine plant

Answer: B

Q77. Base load power plants operate at:

- A) Low load factor
- B) High plant load factor continuously
- C) Peak hours only
- D) Emergency times only

Answer: B

Q78. Moderating material in a nuclear reactor is used to:

- A) Absorb neutrons
- B) Slow down fast neutrons
- C) Cool down the core
- D) Generate electricity directly

Answer: B

Q79. Transmission voltages are stepped up to high levels to:

- A) Increase current
- B) Reduce I^2R power losses in line

- C) Reduce frequency
- D) Simplify insulation

Answer: B

Q80. Which cable insulation material is commonly used in modern underground lines?

- A) Paper
- B) XLPE (Cross-linked Polyethylene)
- C) Rubber
- D) PVC

Answer: B

Q81. The bundle conductors are used in EHV lines to:

- A) Increase line resistance
- B) Reduce corona loss and line reactance
- C) Increase skin effect
- D) Lower line voltage

Answer: B

Q82. Corona effect in transmission lines causes:

- A) Violet glow, hissing noise, and ozone gas generation
- B) Voltage drop only
- C) Temperature drop
- D) Current increase without loss

Answer: A

Q83. Ferranti effect refers to high-voltage transmission lines where receiving-end voltage is:

- A) Less than sending-end voltage at full load
- B) Greater than sending-end voltage at no-load or light load

- C) Equal to sending-end voltage always
- D) Zero

Answer: B

Q84. A circuit breaker automatically opens under fault conditions when triggered by a:

- A) Fuse
- B) Relay
- C) Isolator
- D) Transformer

Answer: B

Q85. What gas is widely used in high-voltage circuit breakers for arc quenching?

- A) Nitrogen
- B) Carbon dioxide
- C) Sulfur Hexafluoride (SF_6)
- D) Argon

Answer: C

Q86. A fuse is a protective device that operates on the principle of:

- A) Magnetic effect of current
- B) Heating effect of current ($I^2 R$)
- C) Electrostatic effect
- D) Chemical effect

Answer: B

Q87. HRC fuse stands for:

- A) High Rupturing Capacity fuse
- B) High Resistance Current fuse

- C) Heat Resistance Capacity fuse
- D) Heavy Relaying Circuit fuse

Answer: A

Q88. Earth fault protection is used to guard against:

- A) Overcurrent
- B) Leakage current to ground
- C) High frequency
- D) Overfrequency

Answer: B

Q89. Megger is an instrument used to measure:

- A) Low resistance
- B) Medium resistance
- C) High insulation resistance
- D) Inductance

Answer: C

Q90. PMMC (Permanent Magnet Moving Coil) instruments measure:

- A) AC only
- B) DC only
- C) Both AC and DC
- D) Frequency

Answer: B

Q91. Moving Iron (MI) instruments can measure:

- A) DC only
- B) AC only

- C) Both AC and DC
- D) Neither AC nor DC

Answer: C

Q92. An oscilloscope is primarily used to visualize:

- A) Power factor
- B) Voltage waveforms over time
- C) Energy consumed
- D) Magnetic flux lines

Answer: B

Q93. A Current Transformer (CT) is used to step down current for:

- A) High voltage generation
- B) Measurement and protection instruments
- C) Rectification
- D) Power factor improvement

Answer: B

Q94. Never open the secondary circuit of an energized Current Transformer (CT) because it generates:

- A) High dangerous voltage across secondary
- B) Excessive short-circuit current
- C) Reverse flux
- D) Low frequency

Answer: A

Q95. Potential Transformers (PT) are connected in:

- A) Series with the line
- B) Parallel across the line

- C) Series-parallel combination
- D) Delta loop only

Answer: B

Q96. The color code for the ground/earth wire in standard international AC wiring is typically:

- A) Red
- B) Black
- C) Green (or Green/Yellow)
- D) Blue

Answer: C

Q97. The primary objective of earthing (grounding) electrical equipment is to:

- A) Reduce electricity bill
- B) Protect human life from electric shock
- C) Increase voltage
- D) Improve power factor

Answer: B

Q98. A residual current circuit breaker (RCCB / GFCI) trips when there is an imbalance between:

- A) Voltage and current
- B) Live (Phase) and Neutral currents
- C) Frequency and power
- D) Resistance and impedance

Answer: B

Q99. What range of electric current through the human body is generally considered threshold for ventricular fibrillation?

- A) $1\text{ mA} - 5\text{ mA}$

B) $10\text{ mA} - 20\text{ mA}$

C) $100\text{ mA} - 200\text{ mA}$

D) $10\text{ A} - 20\text{ A}$

Answer: C

Q100. Diversity factor in power plants is defined as:

A) $\frac{\text{Sum of individual max demands}}{\text{Simultaneous max demand of system}}$

B) $\frac{\text{Average load}}{\text{Peak load}}$

C) $\frac{\text{Max demand}}{\text{Connected load}}$

D) $\frac{\text{Energy generated}}{\text{Time}}$

Answer: A