PRACTICE TEST 8: AIRCRAFT ELECTRICAL SYSTEMS

Instructions: Select the best answer for each question. Each question is based on the Airframe Mechanic Certification Standards

1. Voltage is defined as:
   A. Flow of electrons
   B. Opposition to current flow
   C. Rate of energy consumption
   D. Electrical pressure or potential difference
2. Current is measured in:
   A. Amperes
   B. Volts
   C. Ohms
   D. Watts
3. Resistance is measured in:
   A. Amperes
   B. Volts
   C. Watts
   D. Ohms
4. Ohm's Law states that voltage equals:
   A. Current divided by resistance
   B. Current times resistance
   C. Resistance divided by current
   D. Power times current
5. A circuit with 24 volts and 4 ohms resistance has a current of:
   A. 96 amps
   B. 20 amps
   C. 6 amps
   D. 2 amps
6. Electrical power is measured in:
   A. Watts
   B. Ohms

C. Amperes
D. Volts

7. Power in a DC circuit is calculated as:
   A. Voltage divided by current
   B. Current divided by voltage
   C. Resistance times current
   D. Voltage times current

8. A 12-volt circuit drawing 5 amperes consumes:
   A. 60 watts
   B. 17 watts
   C. 2.4 watts
   D. 7 watts

9. In a series circuit, the same current flows through:
   A. Only the first component
   B. All components
   C. Half the components
   D. No components

10. Total resistance in a series circuit is:
   A. Sum of all individual resistances
   B. Less than smallest resistance
   C. Average of all resistances
   D. Product of all resistances

11. In a parallel circuit, voltage across each branch is:
   A. Different for each branch
   B. The same
   C. Zero
   D. Infinite

12. Total resistance in a parallel circuit is:
   A. Sum of all resistances
   B. Greater than largest resistance
   C. Less than smallest individual resistance
   D. Average of resistances

13. An open circuit has:
   A. Maximum current flow
   B. No current flow
   C. Normal current flow
   D. Reduced voltage

14. A short circuit causes:
    A. No current flow
    B. Reduced current
    C. Normal operation
    D. Excessive current flow

15. Circuit protection devices include:
    A. Fuses, circuit breakers, and current limiters
    B. Resistors only
    C. Switches only
    D. Wire only

16. Fuses protect circuits by:
    A. Reducing voltage
    B. Increasing resistance
    C. Melting link element when current exceeds rating
    D. Switching off manually

17. Circuit breakers differ from fuses by being:
    A. Single-use only
    B. Resettable after tripping
    C. Non-protective
    D. Voltage-sensitive only

18. A tripped circuit breaker should:
    A. Not be reset until fault is found and corrected
    B. Be reset immediately always
    C. Be replaced with higher rating
    D. Be bypassed

19. Wire gauge is inversely related to:
    A. Length
    B. Insulation type
    C. Color
    D. Wire diameter (larger number = smaller wire)

20. AWG stands for:
    A. Alternating Wire Gage
    B. Aircraft Wiring Guide
    C. American Wire Gage
    D. Aluminum Wire Grade

21. Larger diameter wire has:
    A. Higher resistance

B. Lower resistance and higher current capacity
C. Same resistance as small wire
D. No current capacity

22. Wire ampacity depends on:
A. Color only
B. Length only
C. Age only
D. Conductor size, insulation type, and ambient temperature

23. Wire insulation temperature ratings indicate:
A. Maximum operating temperature the insulation can withstand
B. Minimum temperature only
C. Wire color
D. Manufacturing date

24. MIL-W-22759 wire is:
A. Automotive wire
B. Household wire
C. Teflon-insulated aircraft wire
D. Bare wire

25. Wire bundles should be supported at intervals not exceeding:
A. 48 inches
B. 24 inches maximum
C. 6 inches
D. No support needed

26. Wire bundle ties should be:
A. Overtightened
B. Loose
C. Metal only
D. Snug but not crushing insulation

27. Bend radius for wire bundles should be at least:
A. Equal to wire diameter
B. Twice wire diameter
C. Ten times bundle diameter
D. Sharp 90 degrees

28. Wire routing should avoid:
A. Sharp edges, hot areas, and moving parts
B. Straight runs

C. Protected areas
D. Conduits

29. Wire splices in aircraft wiring are:
A. Always acceptable
B. Avoided; use approved connectors where necessary
C. Made with tape only
D. Required every 12 inches

30. Crimped terminals provide:
A. Temporary connections
B. Weak joints
C. Insulation only
D. Reliable electrical and mechanical connection

31. Proper crimping requires:
A. Any pliers
B. Hammer
C. Correct crimp tool for terminal size
D. Soldering iron only

32. Pre-insulated terminals have:
A. Insulation sleeve protecting crimped connection
B. No insulation
C. Metal exposure
D. Temporary covering

33. Ring terminals are used where:
A. Temporary connections needed
B. Quick disconnects required
C. Insulation critical
D. Secure permanent connection required

34. Spade terminals allow:
A. Permanent installation only
B. Disconnection without removing mounting hardware
C. No disconnection
D. Soldered joints only

35. Pin and socket connectors provide:
A. Permanent connections
B. Weak joints
C. Multiple circuit disconnect capability
D. Single wire connections only

36. Cannon plugs are:
    A. Temporary connectors
    B. Household connectors
    C. Single-pin connectors
    D. Multi-pin circular connectors for aircraft

37. Backshell on connector provides:
    A. Strain relief and environmental protection
    B. No function
    C. Decoration
    D. Electrical connection

38. Connector contact inspection checks for:
    A. Color only
    B. Corrosion, damage, and proper tension
    C. Age only
    D. Weight

39. Bonding provides:
    A. Insulation
    B. Color coding
    C. Electrical continuity between metal components
    D. Wire support

40. Bonding jumpers are used to:
    A. Ensure electrical continuity across joints and hinges
    B. Insulate components
    C. Support wire
    D. Mark locations

41. Bonding resistance should be:
    A. Infinite
    B. Very high
    C. Random
    D. Less than 0.003 ohm for most applications

42. Grounding connects:
    A. Positive terminals
    B. Electrical circuit return path to aircraft structure
    C. Insulated components
    D. Batteries in series

43. Ground studs should be:
    A. Painted over

B. Insulated
C. Clean, corrosion-free, making good contact
D. Loose

44. Lead-acid batteries produce:
A. 6 volts per cell
B. 3 volts per cell
C. 1 volt per cell
D. Approximately 2 volts per cell

45. A 12-volt lead-acid battery contains:
A. 6 cells in series
B. 12 cells in parallel
C. 3 cells
D. 24 cells

46. Lead-acid battery electrolyte is:
A. Pure water
B. Saltwater
C. Sulfuric acid and water
D. Alcohol

47. Battery specific gravity indicates:
A. Weight
B. State of charge
C. Age
D. Color

48. A fully charged lead-acid battery cell measures approximately:
A. 1.275–1.300 specific gravity
B. 1.100 specific gravity
C. 2.000 specific gravity
D. 0.500 specific gravity

49. Nickel-cadmium batteries produce:
A. 2 volts per cell
B. 3 volts per cell
C. 0.5 volts per cell
D. Approximately 1.2 volts per cell

50. NiCad battery electrolyte is:
A. Sulfuric acid
B. Hydrochloric acid

C. Potassium hydroxide (caustic)
D. Pure water

51. Thermal runaway in NiCad batteries occurs when:
A. Battery is cold
B. Excessive heat causes uncontrolled temperature rise
C. Battery is disconnected
D. Voltage is low

52. Battery capacity is rated in:
A. Ampere-hours
B. Volts
C. Ohms
D. Watts

53. Battery charging should use:
A. Maximum available current
B. Any charger
C. No voltage control
D. Proper voltage and current limits per specifications

54. Overcharging batteries causes:
A. Improved capacity
B. Longer life
C. Excessive gassing, heat, and damage
D. No effect

55. Battery terminals should be:
A. Painted
B. Clean, tight, and corrosion-free
C. Loose
D. Oxidized

56. Battery acid spills require:
A. No action
B. Water rinse only
C. Ignoring
D. Neutralization with baking soda solution

57. Generators produce:
A. Direct current (DC) through commutator
B. Alternating current only
C. No current
D. Pulsating voltage

58. Alternators produce:
   A. DC only
   B. Pulsating voltage
   C. Alternating current (AC) requiring rectification to DC
   D. No output

59. Voltage regulators control:
   A. Current only
   B. Generator/alternator output voltage within limits
   C. Wire size
   D. Battery capacity

60. Overvoltage protection prevents:
   A. Damage from excessive voltage to electrical system
   B. Low voltage
   C. Current flow
   D. Normal operation

61. Reverse current relay prevents:
   A. Forward current
   B. Voltage regulation
   C. Charging
   D. Battery from discharging through generator

62. Paralleling generators requires:
   A. Different voltages
   B. No regulation
   C. Voltage matching and load sharing
   D. Random connection

63. Alternator advantages over generators include:
   A. Lower output
   B. Higher output at low RPM and lighter weight
   C. Heavier weight
   D. Less reliability

64. Rectifiers in alternators:
   A. Reduce voltage
   B. Increase resistance
   C. Add weight
   D. Convert AC to DC using diodes

65. Three-phase alternators produce:
   A. Smoother DC output after rectification than single-phase

B. Pulsating DC
C. No output
D. AC only without rectification capability

66. Inverters convert:
A. AC to AC
B. Nothing
C. DC to AC for operating AC equipment
D. DC to higher DC

67. Transformers operate on:
A. DC only
B. AC only through electromagnetic induction
C. Either AC or DC
D. No electrical principle

68. Step-up transformers:
A. Reduce voltage
B. Have equal windings
C. Don't function
D. Increase voltage, decrease current

69. Step-down transformers:
A. Decrease voltage, increase current
B. Increase voltage
C. Have no effect
D. Only change current

70. Transformer ratio is determined by:
A. Wire size
B. Core material
C. Number of primary to secondary turns
D. Frequency

71. Relays are:
A. Resistors
B. Electromagnetically operated switches
C. Batteries
D. Generators

72. Contactors are:
A. Relays for low current
B. Insulators

C. Transformers
D. Heavy-duty relays for high current loads

73. Solenoids provide:
A. Linear motion from electromagnetic force
B. Rotation only
C. No motion
D. Voltage regulation

74. Switches control:
A. Voltage level
B. Wire size
C. Circuit opening and closing
D. Transformer ratio

75. Toggle switches are rated for:
A. Appearance only
B. Color
C. Weight
D. Specific voltage and current limits

76. Rotary switches provide:
A. On/off only
B. Multiple position selection
C. No function
D. Linear motion

77. Micro switches use:
A. Small movement to actuate contacts
B. Large force
C. No actuation
D. Manual operation only

78. Push-button switches may be:
A. Permanent only
B. Rotary
C. Momentary (spring return) or latching
D. Non-functional

79. Diodes allow current flow in:
A. Both directions equally
B. No direction
C. Reverse direction only
D. One direction only (forward bias)

80. Light-emitting diodes (LEDs):
   A. Absorb light
   B. Emit light when forward biased
   C. Conduct AC only
   D. Block all current

81. Transistors can function as:
   A. Switches or amplifiers in circuits
   B. Batteries
   C. Generators
   D. Transformers

82. Integrated circuits contain:
   A. Single component
   B. Two components
   C. Multiple components on single chip
   D. No components

83. Shielded wire prevents:
   A. Current flow
   B. Voltage
   C. Normal operation
   D. Electromagnetic interference (EMI)

84. Coaxial cable is used for:
   A. Power distribution
   B. Radio frequency signals requiring shielding
   C. Structural support
   D. Insulation only

85. Twisted pair wiring reduces:
   A. Voltage
   B. Current capacity
   C. Electromagnetic interference through cancellation
   D. Wire length

86. EMI can cause:
   A. Interference with avionics and communication systems
   B. Improved performance
   C. No effects
   D. Increased power

87. Static discharge wicks:
   A. Generate electricity

B. Provide lighting
C. Insulate aircraft
D. Dissipate static electricity to atmosphere

88. Lightning strike protection includes:
A. Plastic components
B. Conductive paths and diverters
C. No protection
D. Insulation only

89. Multimeter can measure:
A. Temperature only
B. Weight only
C. Voltage, current, and resistance
D. Color only

90. Ohmmeter measures resistance and requires:
A. Circuit power off to avoid damage
B. Maximum voltage applied
C. High current
D. AC power only

91. Ammeter measures current and is connected:
A. Parallel to load
B. To ground only
C. Across voltage source
D. In series with load

92. Voltmeter measures voltage and is connected:
A. In series
B. To ground only
C. In parallel across component
D. Through load

93. Continuity testing checks for:
A. Voltage level
B. Complete electrical path (low resistance)
C. Current capacity
D. Insulation quality

94. Megohmmeter (Megger) tests:
A. Insulation resistance at high voltage
B. Current only

C. Wire color
D. Temperature

95. Wire chafing results from:
A. Proper installation
B. Adequate support
C. Protective covering
D. Rubbing against structure or other wires

96. Broken wire strands indicate:
A. Normal condition
B. Improved flexibility
C. Potential failure requiring repair or replacement
D. No concern

97. Overheated wire shows:
A. Normal color
B. Discolored or burned insulation from excessive current
C. Improved insulation
D. No change

98. Corrosion on terminals appears as:
A. Shiny surface
B. Normal condition
C. Improved contact
D. White/green deposits reducing conductivity

99. Loose connections cause:
A. Resistance, heat, voltage drop, and potential arcing
B. Improved current flow
C. Better contact
D. No problems

100. Wire identification markings indicate:
A. Age only
B. Weight only
C. Circuit function, wire number, and gauge per wiring diagram
D. Color preference

Answer Explanations

1. D. Electrical pressure or potential difference Voltage is electrical pressure or potential difference between two points in a circuit, measured in volts. It's the force that pushes electrons through a conductor, analogous to water pressure in a pipe.

2. A. Amperes Current is the flow of electrons through a conductor measured in amperes (amps). One ampere equals one coulomb of charge flowing past a point per second, representing the rate of electron flow.

3. D. Ohms Resistance is opposition to current flow measured in ohms (Ω). Resistance converts electrical energy to heat, limiting current flow through conductors, and varies with material, length, and temperature.

4. B. Current times resistance Ohm's Law states $E = I \times R$ (Voltage = Current × Resistance). This fundamental relationship allows calculating any one value when the other two are known. Also expressed as $I = E/R$ or $R = E/I$.

5. C. 6 amps Using Ohm's Law: $I = E/R = 24V / 4\Omega = 6$ amperes. Current equals voltage divided by resistance, fundamental calculation for analyzing circuit behavior and component ratings.

6. A. Watts Electrical power is measured in watts, representing the rate of energy consumption or production. One watt equals one joule per second, quantifying how quickly energy is used or generated.

7. D. Voltage times current Power in DC circuits calculated as $P = E \times I$ (Power = Voltage × Current), measured in watts. Also expressed as $P = I^2R$ or $P = E^2/R$, derived from Ohm's Law.

8. A. 60 watts Power calculation: $P = E \times I = 12V \times 5A = 60$ watts. This represents the rate of energy consumption by the circuit component under these operating conditions.

9. B. All components Series circuits have single current path, so identical current flows through all components. Current is constant throughout series circuit regardless of individual component resistances.

10. A. Sum of all individual resistances Total resistance in series circuits equals sum of individual resistances: $R_t = R_1 + R_2 + R_3$... Series connection increases total resistance, reducing overall current flow.

11. B. The same Parallel circuits have multiple paths, but voltage across each branch equals source voltage. All parallel branches experience identical voltage regardless of individual branch resistances.

12. C. Less than smallest individual resistance Total parallel resistance is always less than smallest individual resistance. Calculated as $1/R_t = 1/R_1 + 1/R_2 + 1/R_3$... Multiple paths reduce overall resistance, increasing total current.

13. B. No current flow Open circuits have broken or disconnected path preventing current flow. Infinite resistance at break point stops all electron movement despite applied voltage.

14. D. Excessive current flow Short circuits create unintended low-resistance path allowing excessive current flow, potentially causing overheating, fire, or component damage. Circuit protection devices prevent damage by interrupting current.

15. A. Fuses, circuit breakers, and current limiters Circuit protection devices safeguard wiring and components from excessive current by interrupting circuit when current exceeds safe limits. Essential for preventing electrical fires and equipment damage.

16. C. Melting link element when current exceeds rating Fuses protect circuits through fusible link that melts when current exceeds rating, opening circuit. Once blown, fuses must be replaced; they cannot be reset.

17. B. Resettable after tripping Circuit breakers are resettable protection devices opening circuits when overloaded, using thermal or magnetic mechanisms. Can be reset after tripping and fault correction, unlike single-use fuses.

18. A. Not be reset until fault is found and corrected Tripped circuit breakers indicate fault condition requiring investigation and correction before resetting. Immediate reset without troubleshooting risks fire, equipment damage, or repeated tripping.

19. D. Wire diameter (larger number = smaller wire) AWG (American Wire Gage) system inversely relates number to diameter; larger numbers indicate smaller wire diameters. AWG 10 is larger diameter than AWG 20.

20. C. American Wire Gage AWG (American Wire Gage) is standard system for designating wire sizes in the United States, with numerical designations inversely related to conductor cross-sectional area.

21. B. Lower resistance and higher current capacity Larger diameter wire has lower resistance per unit length and higher current-carrying capacity (ampacity). More cross-sectional area allows more electrons to flow with less resistance.

22. D. Conductor size, insulation type, and ambient temperature Wire ampacity (current-carrying capacity) depends on conductor size, insulation temperature rating, ambient temperature, and installation method. Higher temperatures reduce safe current capacity.

23. A. Maximum operating temperature the insulation can withstand Insulation temperature ratings indicate maximum continuous operating temperature insulation can withstand without degradation. Common ratings include 105°C, 135°C, and 200°C for different applications.

24. C. Teflon-insulated aircraft wire MIL-W-22759 specifies Teflon-insulated aircraft wire providing excellent temperature resistance (200°C), chemical resistance, and durability. Standard for modern aircraft electrical installations.

25. B. 24 inches maximum Wire bundles require support at maximum 24-inch intervals preventing excessive sagging, chafing, and vibration damage. Shorter intervals required near terminations and in high-vibration areas.

26. D. Snug but not crushing insulation Wire bundle ties (lacing cord or cable ties) should be snug enough to secure wires without crushing insulation or restricting wire movement from vibration and thermal expansion.

27. C. Ten times bundle diameter Minimum bend radius for wire bundles should be at least ten times bundle diameter preventing conductor damage and insulation stress. Tighter bends risk wire breakage and insulation cracking.

28. A. Sharp edges, hot areas, and moving parts Wire routing must avoid sharp edges causing chafing, hot areas degrading insulation, and moving parts causing abrasion or fatigue. Proper routing prevents premature wire failure.

29. B. Avoided; use approved connectors where necessary Wire splices should be avoided in aircraft wiring; use approved connectors, terminal blocks, or junction boxes instead. Splices create potential failure points and maintenance difficulties.

30. D. Reliable electrical and mechanical connection Crimped terminals provide both reliable electrical conductivity and mechanical strength when properly installed with correct tools. Gas-tight connection resists corrosion and vibration loosening.

31. C. Correct crimp tool for terminal size Proper crimping requires correct tool matching terminal size ensuring proper compression without over-crimping (wire damage) or under-crimping (loose connection). Pliers create unreliable crimps.

32. A. Insulation sleeve protecting crimped connection Pre-insulated terminals include factory-installed insulation sleeve covering barrel and crimp area, protecting connection from moisture, corrosion, and short circuits while providing strain relief.

33. D. Secure permanent connection required Ring terminals completely encircle mounting stud requiring hardware removal for disconnection, providing most secure mechanical connection for permanent installations preventing accidental disconnection.

34. B. Disconnection without removing mounting hardware Spade terminals (fork terminals) slide under hardware allowing connection/disconnection without removing mounting nuts or screws, convenient for maintenance but less secure than ring terminals.

35. C. Multiple circuit disconnect capability Pin and socket connectors (multi-pin connectors) provide simultaneous connection/disconnection of multiple circuits, essential for quickly connecting/removing avionics, instruments, and removable components.

36. D. Multi-pin circular connectors for aircraft Cannon plugs are multi-pin circular connectors widely used in aircraft for avionic connections. Robust design provides environmental sealing, positive locking, and reliable contact.

37. A. Strain relief and environmental protection Connector backshells provide strain relief preventing wire damage from flexing, environmental sealing protecting contacts from moisture/contaminants, and cable armor attachment point.

38. B. Corrosion, damage, and proper tension Connector contact inspection examines for corrosion reducing conductivity, physical damage preventing proper mating, and proper contact tension ensuring reliable electrical connection preventing intermittent failures.

39. C. Electrical continuity between metal components Bonding provides electrical continuity between metallic aircraft components for static discharge, lightning protection, electromagnetic shielding, and preventing radio frequency interference.

40. A. Ensure electrical continuity across joints and hinges Bonding jumpers maintain electrical continuity across moveable joints, hinges, and non-conductive finishes ensuring continuous electrical path for lightning protection and static discharge.

41. D. Less than 0.003 ohm for most applications Bonding resistance should be less than 0.003 ohm (3 milliohms) for most aircraft applications ensuring effective static discharge and lightning protection. Lower resistance provides better conductivity.

42. B. Electrical circuit return path to aircraft structure Grounding connects electrical circuit return paths to aircraft structure (common ground), providing reference potential and return current path. Structure serves as negative conductor in single-wire systems.

43. C. Clean, corrosion-free, making good contact Ground studs must be clean, free of paint/corrosion, and making solid metal-to-metal contact ensuring low resistance path. Poor grounds cause voltage drops and intermittent electrical problems.

44. D. Approximately 2 volts per cell Lead-acid battery cells produce approximately 2.0 volts (1.8-2.2V range depending on charge state). Multiple cells connected in series create desired battery voltage.

45. A. 6 cells in series A 12-volt lead-acid battery contains 6 cells connected in series, each producing approximately 2 volts. Series connection adds voltages: 6 cells × 2V = 12V nominal.

46. C. Sulfuric acid and water Lead-acid battery electrolyte is sulfuric acid (H_2SO_4) diluted with distilled water, typically 35% acid by weight when fully charged. Electrolyte participates in chemical reactions producing electrical energy.

47. B. State of charge Battery specific gravity indicates state of charge by measuring electrolyte density. Higher specific gravity indicates higher charge; readings taken with hydrometer show sulfuric acid concentration.

48. A. 1.275-1.300 specific gravity Fully charged lead-acid battery cell measures 1.275-1.300 specific gravity at 80°F. Specific gravity decreases during discharge as sulfuric acid is consumed in chemical reactions.

49. D. Approximately 1.2 volts per cell Nickel-cadmium (NiCad) battery cells produce approximately 1.2 volts per cell (1.0-1.4V range). Lower voltage than lead-acid requires more cells for equivalent battery voltage.

50. C. Potassium hydroxide (caustic) NiCad battery electrolyte is potassium hydroxide (KOH), strong caustic base (opposite of acid). Extremely corrosive to skin and aluminum, requires different handling than lead-acid batteries.

51. B. Excessive heat causes uncontrolled temperature rise Thermal runaway in NiCad batteries occurs when excessive heat from overcharging increases internal temperature, reducing resistance, increasing current, generating more heat in dangerous positive feedback loop.

52. A. Ampere-hours Battery capacity rated in ampere-hours (Ah) indicating how much current battery can deliver over specific time. Example: 35 Ah battery delivers 35 amps for 1 hour or 3.5 amps for 10 hours.

53. D. Proper voltage and current limits per specifications Battery charging requires proper voltage and current limits per manufacturer specifications preventing overcharging, excessive gassing, overheating, and battery damage while ensuring complete charging.

54. C. Excessive gassing, heat, and damage Overcharging causes excessive gassing (hydrogen/oxygen production), heat generation, electrolyte loss, plate degradation, and potential thermal runaway in NiCad batteries reducing battery life.

55. B. Clean, tight, and corrosion-free Battery terminals must be clean, tight, and corrosion-free ensuring good electrical contact, minimizing voltage drop, and preventing excessive resistance heating. Corroded connections cause starting problems.

56. D. Neutralization with baking soda solution Battery acid spills require neutralization with baking soda (sodium bicarbonate) solution stopping corrosion, followed by water rinse. NiCad caustic spills need vinegar or boric acid neutralization.

57. A. Direct current (DC) through commutator Generators produce direct current (DC) using commutator and brushes converting alternating current generated in rotating armature to pulsating DC output suitable for aircraft electrical systems.

58. C. Alternating current (AC) requiring rectification to DC Alternators produce alternating current (AC) in stator windings requiring rectification through diodes converting to direct current (DC) for charging batteries and powering aircraft DC systems.

59. B. Generator/alternator output voltage within limits Voltage regulators automatically control generator/alternator output voltage maintaining proper system voltage (typically 14V or 28V nominal) despite varying RPM and electrical loads preventing overcharging or undervoltage.

60. A. Damage from excessive voltage to electrical system Overvoltage protection prevents damage to electrical components, avionics, and batteries from excessive voltage caused by regulator failure, disconnecting generator/alternator if voltage exceeds safe limits.

61. D. Battery from discharging through generator Reverse current relay (cutout relay) prevents battery from discharging back through generator when generator voltage drops below battery voltage during low RPM or shutdown.

62. C. Voltage matching and load sharing Paralleling generators requires matching output voltages and proper load sharing between units preventing one generator from carrying excessive load or back-feeding other generator.

63. B. Higher output at low RPM and lighter weight Alternators produce higher output at lower RPM than generators due to stationary field design, lighter weight from improved cooling, and more reliable with fewer wearing parts (no brushes on rotating armature).

64. D. Convert AC to DC using diodes Rectifiers in alternators convert three-phase AC output to DC using diodes (typically six-diode bridge) providing battery charging and DC system power. Diodes allow current flow in one direction only.

65. A. Smoother DC output after rectification than single-phase Three-phase alternators produce smoother DC output after rectification with less ripple than single-phase systems, reducing filtering requirements and improving power quality for avionics.

66. C. DC to AC for operating AC equipment Inverters convert direct current (DC) from battery or DC bus to alternating current (AC) powering AC instruments, radios, and accessories in aircraft with DC electrical systems.

67. B. AC only through electromagnetic induction Transformers operate only on alternating current (AC) through electromagnetic induction between primary and secondary windings. Changing magnetic field required; transformers don't work on steady DC.

68. D. Increase voltage, decrease current Step-up transformers increase voltage and decrease current proportionally maintaining power ($P = E \times I$). More secondary turns than primary turns increases voltage while reducing current.

69. A. Decrease voltage, increase current Step-down transformers decrease voltage and increase current proportionally maintaining power. Fewer secondary turns than primary turns reduces voltage while increasing available current.

70. C. Number of primary to secondary turns Transformer voltage ratio determined by turns ratio: $V_s/V_p = N_s/N_p$. Voltage ratio equals ratio of secondary to primary winding turns. Current ratio is inverse of voltage ratio.

71. B. Electromagnetically operated switches Relays are electromagnetically operated switches using small control current energizing coil creating magnetic field pulling armature closing contacts, allowing small switches to control high-current circuits safely.

72. D. Heavy-duty relays for high current loads Contactors are heavy-duty relays designed for high current loads (starter motors, landing gear motors), using robust contacts and arc suppression handling high current switching without damage.

73. A. Linear motion from electromagnetic force Solenoids convert electrical energy to linear mechanical motion using electromagnetic coil pulling plunger or armature. Used for valves, locks, and mechanical actuators throughout aircraft systems.

74. C. Circuit opening and closing Switches manually or automatically control circuit opening and closing, directing current flow to desired circuits. Various types include toggle, rotary, push-button, and limit switches.

75. D. Specific voltage and current limits Toggle switches rated for specific voltage and current limits ensuring contacts can safely interrupt specified loads without arcing, overheating, or welding. Exceeding ratings causes failure.

76. B. Multiple position selection Rotary switches provide multiple position selection using rotating contact selecting between different circuits. Common for mode selection, range selection, and multi-function controls.

77. A. Small movement to actuate contacts Microswitches use very small actuator movement (typically 0.01-0.05 inch) to rapidly snap contacts open/closed. Precision switches for position sensing, limit switches, and safety interlocks.

78. C. Momentary (spring return) or latching Push-button switches available as momentary (spring return to off when released) for temporary functions or latching (stay in position until pushed again) for on/off control.

79. D. One direction only (forward bias) Diodes allow current flow in one direction only (forward bias) while blocking reverse current. Semiconductor PN junction creates one-way valve for electrons, fundamental for rectification.

80. B. Emit light when forward biased Light-emitting diodes (LEDs) emit light when forward biased as electrons recombine with holes releasing energy as photons. Energy-efficient indicators and displays throughout modern aircraft.

81. A. Switches or amplifiers in circuits Transistors function as electronic switches (on/off) or amplifiers (increasing signal strength) using small base current controlling larger collector-emitter current. Foundation of modern electronics.

82. C. Multiple components on single chip Integrated circuits (ICs) contain multiple electronic components (transistors, resistors, capacitors) fabricated on single semiconductor chip, enabling complex functions in compact packages throughout avionics.

83. D. Electromagnetic interference (EMI) Shielded wire prevents electromagnetic interference using conductive braid or foil surrounding inner conductor, blocking external EMI from affecting signal and preventing wire from radiating interference.

84. B. Radio frequency signals requiring shielding Coaxial cable used for radio frequency signals (antenna, navigation, communication) providing constant impedance and excellent shielding. Center conductor surrounded by insulation, shield, and jacket.

85. C. Electromagnetic interference through cancellation Twisted pair wiring reduces EMI through electromagnetic field cancellation. Equal and opposite currents in adjacent twisted wires produce canceling magnetic fields reducing radiation and susceptibility.

86. A. Interference with avionics and communication systems EMI (Electromagnetic Interference) causes interference with avionics, navigation, and communication systems through radiated or conducted electrical noise. Shielding, filtering, and proper grounding minimize EMI effects.

87. D. Dissipate static electricity to atmosphere Static discharge wicks (trailing edge mounted) dissipate static electricity accumulated during flight to atmosphere preventing radio interference and reducing lightning strike risk through controlled discharge points.

88. B. Conductive paths and diverters Lightning strike protection includes bonding providing conductive paths conducting lightning current safely through structure, diverter strips at extremities, and protection for fuel tanks/systems preventing ignition.

89. C. Voltage, current, and resistance Multimeters (multi-function meters) measure voltage (voltmeter function), current (ammeter function), and resistance (ohmmeter function), essential troubleshooting tool combining multiple test functions in one instrument.

90. A. Circuit power off to avoid damage Ohmmeter measures resistance and requires circuit power off because ohmmeter supplies own test voltage. Measuring resistance in powered circuit damages meter and provides incorrect readings.

91. D. In series with load Ammeter measures current and must be connected in series with load allowing measured current to flow through meter. Parallel connection causes short circuit damaging meter.

92. C. In parallel across component Voltmeter measures voltage and connects in parallel across component measuring potential difference between two points. High internal resistance prevents affecting circuit operation.

93. B. Complete electrical path (low resistance) Continuity testing checks for complete electrical path indicating low resistance (typically under 1 ohm). Used to verify wiring connections, detect breaks, and confirm circuit paths.

94. A. Insulation resistance at high voltage Megohmmeter (Megger) tests insulation resistance applying high voltage (typically 500-1000V) measuring leakage current through insulation detecting degradation invisible to standard ohmmeter low-voltage testing.

95. D. Rubbing against structure or other wires Wire chafing results from vibration causing wires to rub against structure, sharp edges, or other wires, gradually wearing through insulation potentially causing shorts and fires.

96. C. Potential failure requiring repair or replacement Broken wire strands (more than 10% of strands in single conductor) indicate potential failure from flexing fatigue or overload requiring wire replacement. Reduced cross-section increases resistance.

97. B. Discolored or burned insulation from excessive current Overheated wire shows discolored, darkened, or burned insulation from excessive current causing resistance heating. Indicates overload, poor connection, or undersized wire requiring immediate correction.

98. D. White/green deposits reducing conductivity Terminal corrosion appears as white powdery deposits (aluminum corrosion), green/blue deposits (copper corrosion), or rust (steel), increasing resistance and potentially causing intermittent connections or failures.

99. A. Resistance, heat, voltage drop, and potential arcing Loose connections increase resistance causing heat generation, voltage drop reducing equipment performance, and potential arcing risking fire. All connections must be tight and properly torqued.

100. C. Circuit function, wire number, and gauge per wiring diagram Wire identification markings indicate circuit function, wire number matching wiring diagrams, and wire gauge enabling proper troubleshooting, maintenance, and ensuring correct connections during repairs.