PRACTICE EXAM 6 — 150 QUESTIONS

Domain 1 — Electrical Skills (Questions 1–68)

1. An apprentice says, "To find current, I just multiply voltage by resistance." How should you correct this?

A. Current equals voltage times resistance

B. Current equals voltage divided by resistance

C. Current equals resistance divided by voltage

D. Current equals power times voltage

2. A trainee asks how much current a 1,200-watt fixture draws on 120 volts. What is your answer?

A. 14,400 amps

B. 10 amps

C. 0.1 amps

D. 1,200 amps

3. A coworker insists that resistors in parallel always increase total resistance. What is the correct principle?

A. Parallel resistance equals the sum of branches

B. Parallel resistance always exceeds the largest branch

C. Parallel resistance is unaffected by adding branches

D. Parallel resistance is less than the smallest branch

4. An apprentice asks why "three-phase" calculations always include 1.732. What do you tell them?

A. It is the square root of 2

B. It is the reciprocal of the power factor

C. It is the square root of 3

D. It is pi divided by two

5. A trainee claims a 120 V outlet's waveform peaks at exactly 120 volts. How do you respond?

A. Yes, peak equals the RMS value

B. No, it peaks at about 85 volts

C. No, it peaks at about 240 volts

D. No, it peaks at about 170 volts

6. A coworker measures 120 V line-to-neutral on a wye system and asks for the line-to-line voltage. What is it?

A. About 208 volts

B. About 120 volts

C. About 360 volts

D. About 60 volts

7. An apprentice asks why the neutral in an all-dimmer three-phase rig runs hot despite balanced phases. What is the cause?

A. The fundamental currents add in the neutral

B. A loose ground connection

C. Triplen harmonics adding in the neutral

D. Excessive line voltage

8. A trainee wants to measure current on a live 100-amp feeder. What do you recommend?

A. Wire a multimeter in series

B. Use an ohmmeter across the conductors

C. Apply a megohmmeter to the live feeder

D. Use a clamp meter around one conductor

9. A coworker says a "dead" reading of 0 V proves a circuit is safe. What is the correct practice?

A. Prove the meter on a known-live source first

B. Trust the single zero reading

C. Check the wire colors instead

D. Measure the resistance to confirm

10. An apprentice asks which fixture type takes constant power and dims itself via data. What do you say?

A. A conventional PAR

B. A Fresnel

C. A cyc light

D. A moving light

11. A trainee plans to feed a moving light from a forward-phase dimmer. Why do you stop them?

A. It will improve the fixture's output

B. The chopped waveform can damage the fixture

C. It will increase the supply frequency

D. It needs a larger gobo

12. A coworker asks how many channels are in one DMX universe. What is your answer?

A. 128 channels

B. 256 channels

C. 1,024 channels

D. 512 channels

13. An apprentice asks what value terminator goes on the last DMX device. What do you tell them?

A. 120 ohms

B. 75 ohms

C. 600 ohms

D. 50 ohms

14. A trainee asks what an opto-splitter provides. How do you describe it?

A. Multiple optically isolated outputs from one input

B. A merge of two consoles into one signal

C. A conversion of DMX to network data

D. A 1:1 voltage isolation only

15. A coworker says RDM works through any DMX splitter. What is the correct caution?

A. RDM needs no special components

B. All components in the path must be RDM-compatible

C. RDM only works wirelessly

D. RDM replaces the need for a console

16. An apprentice asks which protocol streams DMX universes over an IP network as the ratified standard. What do you say?

A. RDM

B. sACN (E1.31)

C. PoE

D. Wireless DMX

17. A trainee asks what a node does in a networked rig. How do you explain it?

A. It converts network data to physical DMX outputs

B. It splits a feeder into branch circuits

C. It stores backup battery energy

D. It corrects the power factor

18. A coworker asks why two networked devices connect but cannot communicate. What is the likely reason?

A. Incompatible IP address ranges

B. A missing gobo

C. An unbalanced phase

D. A blown lamp

19. An apprentice asks which dimmer type produces the most harmonics. What do you tell them?

A. Sine-wave dimming

B. Reverse-phase at low level

C. Forward-phase (leading-edge) dimming

D. No dimmer produces harmonics

20. A trainee asks why a forward-phase dimmer generates harmonics. How do you explain it?

A. It boosts the peak voltage

B. It chops the waveform abruptly

C. It lowers the frequency

D. It reverses the polarity

21. A coworker asks what the ground color is in single-pole cam connectors. What do you say?

A. Green

B. White

C. Black

D. Blue

22. An apprentice asks the correct connection order for single-pole connectors. What is it?

A. Hots, then neutral, then ground

B. Ground, then neutral, then hots

C. Neutral, then hots, then ground

D. All at once

23. A trainee asks how many circuits a 19-pin Socapex carries. What is your answer?

A. Three

B. Twelve

C. Nineteen

D. Six

24. A coworker says a loose lug is fine "as long as it's snug enough." Why do you disagree?

A. Loose lugs improve the power factor

B. Loose lugs lower the load current

C. Loose lugs raise the frequency

D. Loose lugs increase resistance and generate heat

25. An apprentice asks why feeder should not be run coiled under load. What do you tell them?

A. Coiling traps heat and can melt insulation

B. Coiling improves the power factor

C. Coiling reduces voltage drop

D. Coiling speeds up the data

26. A trainee asks which connector houses all conductors in one keyed body. What is your answer?

A. A single-pole cam connector

B. A bare-end lug

C. A pin-and-sleeve connector

D. An Edison plug

27. A coworker plans to crimp a terminal with regular pliers. Why do you object?

A. Pliers improve the connection

B. Pliers are faster and acceptable

C. Only a ratcheting tool and die make a gas-tight crimp

D. Crimps are always unreliable anyway

28. An apprentice asks why a long extension cord makes a fixture run dim. What do you explain?

A. The DMX address is wrong

B. The gobo is dirty

C. The frequency is too high

D. Voltage drop over the long run

29. A trainee asks which device controls a conventional tungsten fixture's intensity. What do you say?

A. A relay rack

B. A dimmer

C. A node

D. An opto-splitter

30. A coworker asks why LED fixtures need a relay rack instead of a dimmer rack. What do you explain?

A. LEDs need forward-phase power

B. LEDs need half-wave power

C. LEDs need constant power and dim internally

D. LEDs need reverse polarity

31. An apprentice asks what optimizing a luminaire adjusts. How do you describe it?

A. The lamp's position relative to the reflector

B. The fixture's DMX address

C. The branch breaker size

D. The gel color temperature

32. A trainee asks why a tungsten-halogen lamp must not be touched with bare fingers. What do you say?

A. Skin oil creates a hot spot shortening lamp life

B. It holds a residual charge

C. It is too fragile to grip

D. It contains pressurized gas that leaks

33. A coworker is about to change a xenon arc lamp bare-handed. Why do you stop them?

A. The lamp output will increase

B. No cooling time is needed

C. The glass is harmless to touch

D. It is pressurized and can explode, requiring full protective gear

34. An apprentice asks which fixture projects a sharp gobo pattern. What do you say?

A. A PAR can

B. An ellipsoidal (profile) fixture

C. A cyc light

D. A bare lamp

35. A trainee asks the energy stored in a 48 V, 100 Ah battery. What is it?

A. 100 watt-hours

B. 48 watt-hours

C. 4,800 watt-hours

D. 4.2 watt-hours

36. A coworker asks how long a 4.8 kWh battery runs a 600 W load, ignoring losses. What do you say?

A. 2 hours

B. 4 hours

C. 1 hour

D. 8 hours

37. An apprentice claims real battery runtime equals the ideal calculation exactly. How do you correct this?

A. Yes, it is always exact

B. No, losses and discharge limits make it shorter

C. No, losses make it longer

D. No, the frequency changes it

38. A trainee asks which backup device gives instant, zero-gap power at failure. What do you say?

A. A standby generator alone

B. An online double-conversion UPS

C. A buck/boost transformer

D. A company switch

39. A coworker asks what a buck/boost transformer is for. How do you explain it?

A. To store backup energy

B. To convert DMX to network data

C. To make a small voltage correction

D. To cancel triplen harmonics

40. An apprentice asks why a K-rated transformer is used. What do you tell them?

A. To make small voltage corrections

B. To tolerate harmonic heating from non-linear loads

C. To store energy during outages

D. To convert single-phase to three-phase

41. A trainee asks the peak voltage of a 240 V RMS supply. What do you say?

A. About 339 volts

B. About 170 volts

C. About 480 volts

D. About 120 volts

42. A coworker asks how the three phases are timed relative to each other. What do you explain?

A. Offset by 120 degrees

B. Offset by 90 degrees

C. Offset by 180 degrees

D. In perfect alignment

43. An apprentice asks what frequency North American utility power runs at. What is your answer?

A. 25 Hz

B. 50 Hz

C. 400 Hz

D. 60 Hz

44. A trainee asks why three-phase delivers smoother power than single-phase. How do you explain it?

A. It uses a lower frequency

B. It eliminates the neutral

C. It uses only one conductor

D. Its staggered phases keep combined power continuous

45. A coworker reads near zero on a clamp meter around a loaded cable. What do you suspect?

A. The load is too bright

B. The frequency is wrong

C. The clamp encircles both hot and neutral

D. The meter is in DC mode

46. An apprentice asks what an OL reading on the ohmmeter means. What do you say?

A. A perfect connection

B. A short circuit

C. An open conductor

D. Excess voltage

47. A trainee asks how a voltmeter connects to a circuit. What do you explain?

A. In series in the current path

B. Through the current jacks only

C. Only after de-energizing

D. In parallel across the points

48. A coworker asks which meter category is needed at a 480 V company switch. What do you say?

A. CAT I

B. CAT II

C. None required

D. CAT III or IV

49. An apprentice asks why the resistance function needs a dead circuit. How do you explain it?

A. The circuit must be energized for it

B. It only works at reduced voltage

C. The meter supplies its own test current

D. It needs load current flowing

50. A trainee asks two resistors of 30 ohms in parallel give what total. What is your answer?

A. 60 ohms

B. 30 ohms

C. 15 ohms

D. 0.067 ohms

51. A coworker asks three 10-ohm resistors in series give what total. What do you say?

A. 3.3 ohms

B. 10 ohms

C. 100 ohms

D. 30 ohms

52. An apprentice asks why phase balancing matters. How do you explain it?

A. It raises the line voltage

B. It distributes load evenly and reduces neutral current

C. It converts wye to delta

D. It increases the frequency

53. A trainee asks the line-to-line voltage of a 277 V line-to-neutral wye. What is it?

A. About 480 volts

B. About 277 volts

C. About 160 volts

D. About 600 volts

54. A coworker asks which protocol adds two-way communication to DMX. What do you say?

A. sACN

B. RDM

C. Art-Net

D. PoE

55. An apprentice asks what PoE delivers over one cable. How do you describe it?

A. Only DC power

B. Only control data

C. Both power and data

D. Three-phase power

56. A trainee asks why wireless DMX drops out at festivals. What do you explain?

A. Excessive voltage drop

B. Harmonic distortion of data

C. A blown receiver fuse

D. RF interference and congestion

57. A coworker asks how many universes a rig needs for 1,500 channels. What is your answer?

A. 3 universes

B. 2 universes

C. 1 universe

D. 5 universes

58. An apprentice asks what direction DC flows. How do you describe it?

A. It reverses periodically

B. In one constant direction

C. In a 120-degree pattern

D. At 60 Hz

59. A trainee asks the RMS-to-peak conversion factor. What do you say?

A. RMS equals peak times 0.707

B. Peak equals RMS times 1.414

C. RMS equals peak times 1.414

D. Peak equals RMS times 0.707

60. A coworker asks what a feeder is. How do you describe it?

A. The high-capacity cable from source to distribution

B. The final cable to one fixture

C. The data cable to a node

D. The safety cable on a truss

61. An apprentice asks why a bare-end lug must be torqued to spec. How do you explain it?

A. To prevent the resistance, heat, and fire of a loose connection

B. To improve the power factor

C. To increase the data rate

D. To lower the supply frequency

62. A trainee asks what a distro does. How do you describe it?

A. Converts AC to DC

B. Stores backup energy

C. Transmits DMX data

D. Splits a feeder into protected branch circuits

63. A coworker asks what an isolation transformer's turns ratio is. What do you say?

A. 2:1

B. 1:2

C. 1:1

D. 1.732:1

64. An apprentice asks which fixture has a soft-edged beam and a stepped lens. What do you say?

A. An ellipsoidal

B. A Fresnel

C. A bare PAR lamp

D. A moving beam light

65. A trainee asks what the current is for a 4,800 W load at 240 V. What do you say?

A. 11.5 amps

B. 20 amps

C. 40 amps

D. 1,152,000 amps

66. A coworker asks why bundling six Socapex circuits raises concern. How do you explain it?

A. It overflows the DMX channels

B. It loses the ground reference

C. It corrects the power factor

D. Heat buildup requires ampacity derating

67. An apprentice asks what makes a clamp meter able to read without breaking the circuit. How do you explain it?

A. It measures voltage by contact

B. It supplies its own test current

C. It uses a 1:1 transformer ratio

D. It senses the magnetic field around the conductor

68. A trainee asks the line-to-neutral voltage when the wye reads 208 V line-to-line. What is it?

A. About 360 volts

B. About 240 volts

C. About 120 volts

D. About 416 volts

Domain 2 — Regulations, Codes & Life Safety (Questions 69–103)

69. An apprentice asks which code governs how a temporary power system is installed in the US. What do you say?

A. NFPA 70E

B. The National Electrical Code (NFPA 70)

C. ANSI E1.31

D. The UL White Book

70. A coworker confuses the NEC with NFPA 70E. How do you clarify NFPA 70E's role?

A. It governs how systems are installed

B. It is a lighting control protocol

C. It governs safe work practices and arc flash

D. It is the Canadian installation code

71. A trainee asks who has final authority to approve an installation on site. What do you say?

A. The lighting designer

B. The manufacturer

C. The console operator

D. The Authority Having Jurisdiction

72. A coworker asks what the safest condition for electrical work is, per NFPA 70E. What is it?

A. Energized with insulated tools

B. Energized at reduced load

C. De-energized, verified, and locked out

D. Energized with a spotter

73. An apprentice asks who may remove their personal lock during a group lock-out. What do you say?

A. The site supervisor

B. Only the worker who applied it

C. Any qualified electrician

D. Venue security

74. A trainee asks why you cannot just grab a person being shocked. How do you explain it?

A. It would balance the phases

B. It raises the supply voltage

C. It improves reception

D. You would become a second victim

75. A coworker asks what the rescuer's first action is in an electrical-contact emergency. What is it?

A. Pull the victim off immediately

B. De-energize the source first

C. Throw water on the contact

D. Wait for the breaker to trip

76. An apprentice asks what device can correct the heart rhythm after a severe shock. What do you say?

A. A clamp meter

B. A GFCI

C. An AED

D. A multimeter

77. A trainee asks what current a GFCI trips at to protect a person. What is your answer?

A. 5 amps

B. 100 amps

C. About 5 milliamps

D. 500 milliamps

78. A coworker asks at roughly what current fatal fibrillation can occur. What do you say?

A. 1 milliamp

B. 20 amps

C. 100 amps

D. About 100 milliamps

79. An apprentice asks how a GFCI differs from a breaker. How do you explain it?

A. They do the same job

B. The GFCI protects conductors

C. The breaker protects people

D. The GFCI protects people; the breaker protects conductors

80. A trainee asks why PPE is the last line of defense. How do you explain it?

A. PPE eliminates all hazards

B. PPE is always optional

C. Eliminating the hazard takes priority

D. PPE replaces de-energizing

81. A coworker asks what clothing is required for a high arc-flash hazard. What do you say?

A. Ordinary cotton clothing

B. A high-visibility vest only

C. A respirator only

D. Arc-rated clothing matched to the incident energy

82. An apprentice asks which class of fire involves energized equipment. What is your answer?

A. Class C

B. Class A

C. Class K

D. Class B

83. A trainee asks why water must never be used on an energized fire. How do you explain it?

A. It conducts electricity and can electrocute you

B. It evaporates too fast

C. It raises the fire's temperature

D. It triggers the alarm

84. A coworker asks which hazardous material is in many HID lamps. What do you say?

A. Lead

B. Asbestos

C. Mercury

D. Radon

85. An apprentice asks how to handle suspected asbestos in old equipment. What do you tell them?

A. Sand it to inspect

B. Remove it with hand tools

C. Do not disturb it; use qualified abatement

D. Paint over it

86. A trainee asks why a generator must never run enclosed. How do you explain it?

A. It improves harmonics

B. Exhaust carbon monoxide causes poisoning

C. It raises the fault current

D. It interferes with DMX

87. A coworker asks what egress lighting must do if power fails. What do you say?

A. Flash to the booth

B. Illuminate the paths to the exits

C. Shut off to save battery

D. Switch the show to blackout

88. An apprentice asks what fog and haze exposure limits come from. What do you say?

A. The FCC alone

B. The EPA alone

C. The DOT

D. ESTA/ANSI and Actors' Equity

89. A trainee asks which mark indicates NRTL listing. What do you say?

A. A gel maker's logo

B. A union stamp

C. A DMX sticker

D. A UL, ETL, or CSA mark

90. A coworker asks which agency recognizes UL, ETL, and CSA. What is your answer?

A. ANSI

B. NFPA

C. OSHA

D. ESTA

91. An apprentice asks what ESTA's Technical Standards Program develops. What do you say?

A. Government enforcement rules

B. Performer contracts

C. Rental pricing guides

D. Industry consensus standards for entertainment technology

92. A trainee asks which is the Canadian equivalent of NFPA 70E. What do you say?

A. CSA C22.1

B. CSA Z462

C. NFPA 101

D. ANSI E1.31

93. A coworker asks why moisture increases shock danger. How do you explain it?

A. It raises the voltage

B. It improves ampacity

C. It raises the frequency

D. It lowers the body's resistance

94. An apprentice asks what stored-energy hazard remains after disconnecting. What do you say?

A. The supply frequency

B. The conductor color

C. Charge in capacitors or batteries

D. The cable ampacity

95. A trainee asks what lock-out/tag-out guarantees. How do you explain it?

A. The system cannot be re-energized while someone works on it

B. The cable inventory is tracked

C. The phases stay balanced

D. The data network stays isolated

96. A coworker asks why exits must never be blocked. How do you explain it?

A. Blocked exits can cause a mass-casualty event

B. It raises the supply frequency

C. It unbalances the phases

D. It increases voltage drop

97. An apprentice asks how arc flash can injure without contact. How do you explain it?

A. It causes only minor static shock

B. It cannot injure at a distance

C. It causes temporary numbness only

D. Its intense heat can burn from a distance

98. A trainee asks which is a government enforcement agency, not a standard. What do you say?

A. NFPA 70E

B. OSHA

C. ANSI E1.31

D. ESTA

99. A coworker asks which document set governs how to work safely on systems. What do you say?

A. The NEC and CEC

B. NFPA 70E and CSA Z462

C. ANSI E1.31

D. The UL White Book

100. An apprentice asks what GFCI protection is required for near a water effect. How do you explain it?

A. Conductor overload protection

B. Harmonic filtering

C. Voltage-drop correction

D. Protection from shock via leakage to ground

101. A trainee asks the core NFPA 70E principle about energized work. What is it?

A. Energized work is always faster and preferred

B. PPE makes energized work fully safe

C. De-energize wherever feasible; energized work is the exception

D. Voltage below 480 V is never hazardous

102. A coworker asks which is an electrically safe work condition. What do you say?

A. De-energized, verified, and locked out

B. Energized at reduced voltage

C. Protected only by a GFCI

D. With insulated tools nearby

103. An apprentice asks which leading fire cause proper torquing prevents. What do you say?

A. Loose, high-resistance connections

B. Excess gel

C. Tight cable coiling

D. Wrong fixture color

Domain 3 — Entertainment Electrical Systems Planning (Questions 104–150)

104. An apprentice asks what the connected load is. How do you define it?

A. The current during a typical cue

B. The main breaker rating only

C. The sum of all equipment that could draw power

D. The average phase current

105. A trainee asks what load diversity recognizes. How do you explain it?

A. That all equipment runs full at once

B. That not all equipment operates at full simultaneously

C. That voltage drops on long runs

D. That harmonics add in the neutral

106. A coworker wants to apply diversity to critical safety loads that run full. Why do you object?

A. Those loads genuinely run full, so diversity risks overload

B. Diversity always increases voltage

C. Diversity reduces harmonics

D. Diversity improves the power factor

107. An apprentice asks what to confirm first before tying into a service. What do you say?

A. The gel palette

B. Its amperage rating and overcurrent protection

C. The console model

D. The performers' schedule

108. A trainee asks what the tap rules limit. How do you explain it?

A. The color of conductors

B. The number of fixtures

C. The console channels

D. The length of unprotected tap conductors

109. A coworker says a long run that meets ampacity is always fine. How do you correct this?

A. Yes, ampacity is the only concern

B. No, voltage drop may require a larger conductor

C. No, the frequency must be checked

D. No, the gel color matters

110. An apprentice asks the recommended branch-circuit voltage-drop limit. What do you say?

A. About 10 percent

B. About 3 percent

C. About 15 percent

D. About 25 percent

111. A trainee asks which document shows the power system from source to loads. What do you say?

A. A lighting plot

B. A channel hookup

C. A single-line diagram

D. A gel-cut sheet

112. A coworker asks what a lighting plot shows. How do you describe it?

A. Each fixture's position, type, and focus

B. The available fault current

C. The crew schedule

D. The fuel capacity

113. An apprentice asks what a hookup maps. How do you explain it?

A. The venue exits

B. The truss load

C. The fuel supply

D. Each fixture to its circuit and control channel

114. A trainee asks where the shop order comes from. What do you say?

A. The catering plan

B. The parking layout

C. The design documents

D. The weather forecast

115. A coworker wants to skip spares to save money. Why do you push back?

A. Spares inflate the invoice

B. Spares meet union staffing

C. Spares cover inevitable failures and consumables

D. Spares satisfy the designer

116. An apprentice asks what a crew schedule assigns. How do you explain it?

A. The DMX addresses

B. Skilled personnel to each work phase

C. The gel colors

D. The breaker ratings

117. A trainee asks what generator loading target to use for reliability. What do you say?

A. 100 percent of connected load

B. About 75 to 80 percent

C. 110 percent

D. 50 percent of standby

118. A coworker asks how to convert kW to the kVA a generator must supply. What do you say?

A. Divide kW by the power factor

B. Multiply kW by the frequency

C. Add the number of phases

D. Subtract the voltage drop

119. An apprentice asks what equipment SCCR must do relative to available fault current. What do you say?

A. Meet or exceed it

B. Be lower than it

C. Be exactly half of it

D. Be unrelated to it

120. A trainee asks what must be included in total truss load. What do you say?

A. Only the heaviest fixture

B. Only the moving lights

C. Fixtures, cable, distribution gear, and the truss itself

D. Only the data cables

121. A coworker places a heavy distro at unsupported midspan. Why do you object?

A. A point load can overstress the truss

B. It improves the distribution

C. It lowers the truss weight

D. It reduces voltage drop

122. An apprentice asks what the Working Load Limit means. How do you explain it?

A. The maximum load rated for use

B. The breaking strength

C. The component's own weight

D. The maximum span

123. A trainee asks what secondary device every overhead fixture needs. What do you say?

A. A spare gel frame

B. A rated safety cable attached to the structure

C. A second data cable

D. A backup lamp

124. A coworker asks why safety cables are kept short. How do you explain it?

A. To save steel cost

B. To improve beam quality

C. To reduce data latency

D. To limit fall distance and shock load

125. An apprentice asks what fall protection a worker at height needs. What do you say?

A. A tool belt only

B. Insulating gloves only

C. A respirator only

D. A full-body harness, lanyard, and rated anchor

126. A trainee asks why the area below overhead work must be cleared. What do you say?

A. To reduce voltage drop

B. To balance the phases

C. To protect people from dropped objects

D. To improve wireless reception

127. A coworker asks what a pre-rig inspection verifies. How do you explain it?

A. The gel colors

B. The show tempo

C. Supports, clamps, and safety cables before raising a load

D. The DMX patch

128. An apprentice asks why generator sizing must consider motor inrush. What do you say?

A. Inrush lowers the frequency permanently

B. Inrush reduces cable ampacity

C. Inrush improves the power factor

D. Motors draw several times running current at startup

129. A trainee asks what a single-line diagram lets you verify at a glance. What do you say?

A. The gel colors

B. Service capacity and overcurrent coordination

C. The performers' blocking

D. The wireless channels

130. A coworker asks what governs a long feeder that meets ampacity but delivers low voltage. What do you say?

A. The connector color

B. The supply frequency

C. Voltage drop over the run

D. The gel color

131. An apprentice asks what administering inventory prevents. How do you explain it?

A. Excessive harmonics

B. Missing equipment discovered at load-in

C. Phase imbalance

D. High fault current

132. A trainee asks what a buck/boost transformer corrects in planning. What do you say?

A. Voltage slightly below requirements

B. A truss point load

C. A DMX channel shortage

D. Wireless interference

133. A coworker asks which calculation prevents conductor overheating. What do you say?

A. The ampacity calculation

B. The voltage-drop calculation

C. The power-factor calculation

D. The gobo selection

134. An apprentice asks the risk of applying diversity too aggressively. What do you say?

A. Excessive voltage at the load

B. Overload when many loads run full at once

C. Reduced harmonics

D. Improved efficiency

135. A trainee asks when overcurrent ratings should be verified against fault current. What do you say?

A. During planning of the distribution system

B. After the show closes

C. Only for LED rigs

D. Never, breakers self-adjust

136. A coworker asks the correct single-line order from the source. What do you say?

A. Source, disconnect, overcurrent protection, distribution, loads

B. Loads, distros, disconnect, source

C. Distros, source, loads

D. Loads, source, disconnect

137. An apprentice asks what selective coordination achieves. How do you explain it?

A. All breakers trip together

B. The main always trips first

C. No breaker ever trips

D. Only the device nearest the fault opens

138. A trainee asks what a control/riser diagram communicates. What do you say?

A. The truss load distribution

B. The gel cuts

C. The control and data distribution layout

D. The fuel schedule

139. A coworker asks which loads diversity must not be applied to. What do you say?

A. Continuous or critical loads that run full

B. Decorative accent lighting

C. House lighting only

D. Spare circuits

140. An apprentice asks what a means of disconnect must be. How do you explain it?

A. Readily accessible and lockable

B. Matched to the gel color

C. Able to convert AC to DC

D. Able to transmit DMX

141. A trainee asks what a node's DMX output port carries. What do you say?

A. Three-phase power

B. One DMX universe

C. A 120-volt branch

D. A feeder connection

142. A coworker asks what a show floor power diagram shows. What do you say?

A. The gel-cut requirements

B. The followspot cues

C. Power locations across an exhibit floor

D. The performers' rider

143. An apprentice asks why cable weight must be in overhead load calculations. What do you say?

A. A long run can weigh as much as the fixtures

B. Cable changes the beam angle

C. Cable affects the DMX address

D. Cable alters the frequency

144. A trainee asks what a feeder is. How do you describe it?

A. The high-capacity cable from source to distribution

B. The final cable to one fixture

C. The data cable to a node

D. The safety cable on a truss

145. A coworker asks why you reconcile the plot, hookup, and single-line. How do you explain it?

A. To select gel colors

B. To ensure the documents agree and the rig comes together

C. To set the show tempo

D. To schedule catering

146. An apprentice asks what the "10-foot" and "25-foot" tap references mean. What do you say?

A. Cable color codes

B. DMX cable lengths

C. Permitted lengths of unprotected tap conductors

D. Truss span limits

147. A trainee asks what a conductor must satisfy on a long run besides ampacity. What do you say?

A. The console channel count

B. The gobo size

C. The acceptable voltage drop

D. The dimmer curve

148. A coworker asks why a breaker's interrupting rating matters. How do you explain it?

A. It must meet or exceed available fault current or risk rupturing

B. It sets the gel color

C. It counts the DMX universes

D. It selects the gobo

149. An apprentice asks why the planning domain defines the advanced practitioner. What do you say?

A. It eliminates grounding

B. It replaces the codes

C. It converts knowledge into a safe, documented, installable system

D. It removes safety cables

150. A trainee asks why a worst-case cue matters for planning. What do you say?

A. It changes the gobo selection

B. It changes the DMX universe count

C. It changes the color temperature

D. It challenges the realistic application of load diversity

Full Answer Key & Explanations

1. B — Current equals voltage divided by resistance (I = E ÷ R), not voltage times resistance. The apprentice has confused the current form with the voltage form of Ohm's Law.

2. B — Using I = P ÷ E, 1,200 W ÷ 120 V = 10 amps. Wattage divided by voltage gives the amperage a fixture draws.

3. D — Total parallel resistance is always less than the smallest branch, because each added path gives current another route. The coworker's belief is backwards.

4. C — The 1.732 factor is the square root of 3, which appears in all three-phase calculations. Recognizing it as √3 reinforces why it accompanies three phases.

5. D — A 120 V RMS waveform peaks at V_rms × 1.414 ≈ 170 V, not 120 V. RMS is the effective value, not the peak.

6. A — Line-to-line = line-to-neutral × 1.732 = 120 × 1.732 ≈ 208 V. This is the standard 120/208 V wye relationship.

7. C — Triplen harmonics from non-linear dimmer loads add in the neutral rather than canceling, so it runs hot even with balanced phases. This is why heavily dimmed rigs need oversized neutrals.

8. D — A clamp meter reads current magnetically around a single conductor without breaking the live feeder. A series multimeter would require interrupting it and is unsafe at that current.

9. A — A single 0 V reading can come from a faulty meter, so the meter must be proven on a known-live source (live-dead-live). Trusting an unverified zero can be fatal.

10. D — A moving light takes constant power and dims itself internally via data. Conventional PARs, Fresnels, and cyc lights are dimmed externally instead.

11. B — A moving light needs constant power; a forward-phase dimmer's chopped waveform can damage its internal power supply. Intensity must be controlled via data, not a dimmer.

12. D — One DMX universe carries 512 channels. Rigs needing more require additional universes.

13. A — The last device in a DMX chain takes a 120-ohm terminator to prevent signal reflections. A missing terminator causes flicker and erratic behavior.

14. A — An opto-splitter produces multiple optically isolated outputs from one input, feeding several chains while protecting each branch from ground loops. The isolation is its defining feature.

15. B — RDM requires that all components in the path be RDM-compatible; a non-RDM splitter blocks the return communication. The coworker's assumption is unsafe.

16. B — sACN (E1.31) is the ratified standard for streaming DMX universes over an IP network. Art-Net is a widely used predecessor.

17. A — A node converts network data (sACN/Art-Net) into physical DMX outputs at the fixtures. It is the bridge between the network and DMX gear.

18. A — Networked devices that connect physically but can't communicate usually sit on incompatible IP address ranges. Aligning the IP scheme resolves this common fault.

19. C — Forward-phase (leading-edge) dimming chops the waveform abruptly, generating the most harmonics of the common dimmer types. Sine-wave dimming is the cleanest.

20. B — A forward-phase dimmer chops the waveform abruptly each half-cycle, and that sharp switching generates harmonics. The distortion is a direct result of the chopping.

21. A — Green is the ground color in single-pole cam connectors. White is neutral, and black, red, and blue are the hots.

22. B — The connection order is ground, then neutral, then the hots last, so the references are present before any hot becomes live. The disconnect order reverses this.

23. D — A standard 19-pin Socapex carries six 20-amp circuits. Bundling these conductors requires ampacity derating consideration.

24. D — A loose lug increases resistance, which generates heat ($P = I^2R$) in a runaway cycle, making it a fire hazard. "Snug enough" is not acceptable on high-current terminations.

25. A — Coiled feeder under load traps heat and can melt the insulation or start a fire. Cable must be fully extended before applying load.

26. C — A pin-and-sleeve connector houses all conductors in one keyed, polarized body. Single-pole connectors carry one conductor each instead.

27. C — Only a ratcheting crimp tool with the correct die makes a gas-tight crimp; ordinary pliers produce a high-resistance connection that fails. Pliers are never acceptable for crimping.

28. D — A dim fixture at the end of a long cord results from voltage drop over the run's resistance. A larger gauge or shorter run restores voltage.

29. B — A dimmer controls a conventional tungsten fixture's intensity by regulating delivered power. Relays only switch, and nodes and splitters handle data.

30. C — LED fixtures need constant power and dim internally via data, so a relay rack suits them. Phase-control dimming can damage their power supplies.

31. A — Optimizing (bench focus) adjusts the lamp's position relative to the reflector for an even or peak field. Poor alignment wastes output and creates uneven beams.

32. A — Skin oil creates a hot spot on a tungsten-halogen envelope, shortening lamp life or causing failure. Lamps must be handled with a cloth or glove.

33. D — A xenon arc lamp is pressurized and can explode if mishandled, requiring full protective gear and the manufacturer's procedure. It must also be cooled and de-energized first.

34. B — An ellipsoidal (profile) fixture produces a hard-edged beam and projects sharp gobos. PARs, cyc lights, and bare lamps cannot project sharp gobos.

35. C — Energy = V × Ah = 48 × 100 = 4,800 watt-hours. This figure lets a technician estimate runtime.

36. D — Runtime = Energy ÷ Load = 4,800 Wh ÷ 600 W = 8 hours (ideal). Real runtime is shorter due to conversion losses and depth-of-discharge limits.

37. B — Real runtime is shorter than the ideal calculation because of inverter losses and depth-of-discharge limits. The calculated figure is a theoretical maximum.

38. B — An online double-conversion UPS runs the load continuously from its inverter, giving zero-gap power at failure. A generator alone takes seconds to start.

39. C — A buck/boost transformer makes a small voltage correction, raising or lowering the supply slightly toward equipment requirements. It does not store energy or convert data.

40. B — A K-rated transformer tolerates harmonic heating from non-linear loads without overheating. Higher K-numbers handle heavier harmonic content.

41. A — $V_{pk} = V_{rms} \times 1.414 = 240 \times 1.414 \approx 339$ V. The peak of an AC waveform is substantially higher than its RMS rating.

42. A — The three phases are offset by 120 electrical degrees, one-third of a cycle. This staggered spacing keeps combined power smooth.

43. D — North American utility frequency is 60 Hz. Europe and many touring destinations use 50 Hz.

44. D — Three-phase delivers smoother power because its staggered (120°-offset) phases keep combined delivery continuous. It also delivers more power per conductor than single-phase.

45. C — A near-zero clamp reading on a loaded cable usually means the clamp encircles both hot and neutral, whose opposing fields cancel. A clamp must read one conductor at a time.

46. C — An OL (open line) reading indicates a broken, open conductor with no continuous path. A good conductor reads near zero ohms.

47. D — A voltmeter connects in parallel across the points being measured, because its high resistance draws negligible current. The rule is voltage in parallel, current in series.

48. D — Work at a 480 V company switch requires a CAT III or CAT IV meter rated for the voltage, due to high transient fault energy. An under-rated meter risks a catastrophic arc.

49. C — The resistance function needs a dead circuit because the meter supplies its own test current and expects no external voltage. Measuring live gives false readings and can damage the meter.

50. C — Two equal parallel resistors halve: 30 ÷ 2 = 15 ohms. Total parallel resistance always falls below the smallest branch.

51. D — Series resistances add: 10 + 10 + 10 = 30 ohms. In series, the total is the sum of the parts.

52. B — Phase balancing distributes load evenly across the phases, which reduces neutral current and prevents overloads. It does not change the line voltage or frequency.

53. A — Line-to-line = line-to-neutral × 1.732 = 277 × 1.732 ≈ 480 V. This is the common 277/480 V wye service.

54. B — RDM adds two-way communication to DMX512, allowing remote device management. All components in the path must be RDM-compatible.

55. C — Power over Ethernet (PoE) delivers both power and data over one cable. The supplying switch and cable must support PoE.

56. D — Wireless DMX shares the radio spectrum and suffers RF interference and congestion in crowded environments. This is why critical control is often kept wired.

57. A — 1,500 channels ÷ 512 per universe = 2.93, rounding up to 3 universes. Two universes cover only 1,024 channels.

58. B — Direct current flows in one constant direction, unlike AC which reverses periodically. Batteries and solar supply DC.

59. B — Peak equals RMS times 1.414 ($V_{pk} = V_{rms} \times 1.414$). The other direction, RMS from peak, uses 0.707.

60. A — A feeder is the high-capacity cable from the source to the distribution equipment, the system's backbone. Branch circuits carry the final leg to fixtures.

61. A — A bare-end lug must be torqued to spec to prevent the resistance, heat, and fire of a loose connection ($P = I^2R$). "By feel" is not acceptable on high-current terminations.

62. D — A distro splits one large feeder into multiple overcurrent-protected branch circuits. It is also where outputs are assigned across phases for balancing.

63. C — An isolation transformer has a 1:1 turns ratio, so it changes no voltage and exists to electrically separate the secondary. This reduces noise and creates a separately derived system.

64. B — A Fresnel has a stepped lens and produces a soft-edged beam. Ellipsoidals produce hard-edged beams, and PARs and beam lights differ in optics.

65. B — Using $I = P \div E$, 4,800 W ÷ 240 V = 20 amps. The same load draws half the current at 240 V that it would at 120 V.

66. D — Six fully loaded circuits in one jacket trap heat, requiring ampacity derating for bundling. The conductors cannot each carry full breaker rating simultaneously without derating.

67. D — A clamp meter senses the magnetic field around a conductor, allowing it to read current without electrical contact or breaking the circuit. This is its defining advantage.

68. C — Line-to-neutral = line-to-line ÷ 1.732 = 208 ÷ 1.732 ≈ 120 V. This is why a 120/208 V service gives 120 V to neutral.

Domain 2 — Regulations, Codes & Life Safety

69. B — The National Electrical Code (NFPA 70) governs how temporary power systems are installed in the US. NFPA 70E instead governs safe work practices.

70. C — NFPA 70E governs safe work practices and arc flash, distinct from the NEC's installation role. Clarifying this distinction resolves the apprentice's confusion.

71. D — The Authority Having Jurisdiction (AHJ) has final authority to approve an installation on a specific site. Codes set the baseline, but the AHJ decides.

72. C — NFPA 70E's safest condition is de-energized, verified, and locked out. Energized work is permitted only when de-energizing is genuinely infeasible.

73. B — Only the worker who applied a personal lock may remove it, guaranteeing no one re-energizes while that worker is exposed. Removing another's lock is strictly prohibited.

74. D — Touching a victim still in contact with a live source makes the rescuer a second victim by joining the circuit. The source must be removed first.

75. B — The rescuer must de-energize the source first, before touching the victim. Only after the power is removed is it safe to assist.

76. C — An AED can analyze the rhythm and deliver a shock to correct the ventricular fibrillation that shock can cause. Prompt use is lifesaving for an electrocution victim.

77. C — A GFCI trips at about 5 milliamps of ground-fault imbalance, set below the level that can stop a heart. It protects people, unlike a breaker.

78. D — Fatal ventricular fibrillation can occur at currents as low as about 100 milliamps. This is why GFCI protection trips at a far lower 5 mA threshold.

79. D — A GFCI protects people from shock by detecting hot-neutral imbalance, while a breaker protects conductors from overload. They do different jobs.

80. C — PPE is the last line of defense because eliminating the hazard, such as by de-energizing, always takes priority. PPE protects only when the hazard cannot be removed.

81. D — A high arc-flash hazard requires arc-rated clothing matched to the incident energy from the hazard analysis. Ordinary clothing can ignite under arc-flash energy.

82. A — A Class C fire involves energized electrical equipment and requires a non-conductive agent. Water must never be used on energized equipment.

83. A — Water conducts electricity, so using it on an energized fire can electrocute you. The equipment must be de-energized first.

84. C — Many HID lamps contain mercury, which is toxic and released if broken, requiring special handling and disposal. They must never go in regular trash.

85. C — Suspected asbestos must not be disturbed; qualified abatement is required. Sanding, removing, or painting over it can release carcinogenic fibers.

86. B — Generator exhaust contains carbon monoxide, which causes poisoning in enclosed spaces. Generators must never run enclosed.

87. B — Egress lighting must illuminate the paths to the exits when power fails, so occupants can evacuate. It is a life-safety system that must never be defeated.

88. D — Fog and haze exposure limits come from ESTA/ANSI standards and Actors' Equity agreements. Atmospherics are a regulated health-and-safety matter.

89. D — A UL, ETL, or CSA mark indicates listing by a Nationally Recognized Testing Laboratory. The AHJ may require listed equipment.

90. C — OSHA recognizes UL, ETL, and CSA as Nationally Recognized Testing Laboratories. This recognition gives their listing marks regulatory standing.

91. D — ESTA's Technical Standards Program develops industry consensus standards for entertainment technology, including the ANSI E1 series. ESTA also administers the ETCP certifications.

92. B — CSA Z462 is the Canadian equivalent of NFPA 70E for electrical safety. CSA C22.1 is the installation code instead.

93. D — Moisture lowers the body's resistance, allowing more current to flow for a given voltage. This is why wet locations demand GFCI protection and extra caution.

94. C — Charge stored in capacitors or batteries can remain lethal after disconnection. Zero energy must be verified and stored energy discharged before contact.

95. A — A lock-out lock guarantees the system cannot be re-energized while someone is working on it. It is the procedure that keeps de-energization reliably safe.

96. A — Blocked exits can cause a mass-casualty event by preventing safe evacuation. Egress paths must remain clear at all times.

97. D — An arc flash's intense heat can cause severe burns from a distance, without direct contact. This is the strongest reason to de-energize before working.

98. B — OSHA is a government enforcement agency, while NFPA 70E, ANSI E1.31, and ESTA are consensus standards or standards bodies. OSHA enforces and may reference them.

99. B — NFPA 70E and CSA Z462 govern how to work safely on electrical systems. The NEC and CEC instead govern how systems are installed.

100. D — A GFCI near a water effect protects against shock from current leaking to ground, tripping at about 5 mA. It is the difference between a nuisance trip and a fatality.

101. C — NFPA 70E's core principle is to de-energize wherever feasible, treating energized work as the exception. "Faster to leave it live" is never acceptable.

102. A — An electrically safe work condition is de-energized, verified de-energized, and locked out. Reduced voltage or a nearby GFCI does not meet this standard.

103. A — Loose, high-resistance connections are the leading cause of electrical fires, generating heat ($P = I^2R$) that proper torquing prevents. Correct torque stops the runaway cycle.

Domain 3 — Entertainment Electrical Systems Planning

104. C — The connected load is the sum of all equipment that could draw power, the starting figure before diversity is applied. It is the theoretical maximum, not realistic demand.

105. B — Load diversity recognizes that not all equipment operates at full power simultaneously, so actual demand is less than connected load. It allows economical service sizing.

106. A — Diversity must not be applied to critical safety loads that genuinely run full, because they do peak — applying diversity risks overload. Critical loads are an exception.

107. B — Before tie-in, the service's amperage rating and overcurrent protection must be confirmed. You cannot draw more than the service is rated to supply.

108. D — The tap rules limit the length of conductors tapped off a feeder without overcurrent protection at their own ampacity. The length limit prevents an undetected overload.

109. B — A long run that meets ampacity may still drop too much voltage, requiring a larger conductor. Voltage drop, not just ampacity, governs long runs.

110. B — The recommended branch-circuit voltage-drop limit is about 3 percent (about 5 percent total). Staying within this keeps equipment performing properly.

111. C — A single-line diagram shows the power system structure from source to loads. It conveys the system's electrical layout at a glance.

112. A — A lighting plot shows each fixture's position, type, and focus. Electricians use it to hang and circuit the rig.

113. D — A hookup (channel schedule) maps each fixture to its circuit and control channel. It ties physical fixtures to control assignments.

114. C — The shop order is derived from the design documents — the plot, hookup, and single-line. Building it methodically from the plans ensures nothing needed is forgotten.

115. C — Spares cover inevitable failures and consumables, such as extra lamps and connectors. Their small cost is trivial next to a stalled load-in.

116. B — A crew schedule assigns appropriately skilled personnel to each work phase. The best design fails without enough qualified hands in the available time.

117. B — A generator should be loaded to about 75 to 80 percent for reliability, leaving headroom for inrush, imbalance, and additions. Loading to 100 percent leaves no margin.

118. A — Apparent power (kVA) is found by dividing the kW figure by the power factor. A 60 kW load at 0.8 PF requires 75 kVA.

119. A — The equipment's SCCR must meet or exceed the available fault current at its location, so a fault doesn't destroy it. An under-rated SCCR is a severe hazard.

120. C — Total truss load must include the fixtures, cable, distribution gear, and the truss itself. Cable weight in particular is routinely underestimated.

121. A — A heavy distro at unsupported midspan creates a concentrated point load that can overstress a truss rated for distributed load. Load must follow the structure's rated distribution.

122. A — The Working Load Limit (WLL) is the maximum load a component is rated to carry in use, not its breaking strength. The safety factor between them is not usable capacity.

123. B — Every overhead fixture needs a rated safety cable attached to the structure as secondary suspension if the primary clamp fails. It is the most important habit in overhead work.

124. D — Short safety cables limit the fall distance and resulting shock load if the clamp fails. A long cable lets the fixture drop far and build dangerous force.

125. D — Working at height requires a full-body harness, lanyard, and rated anchor for fall arrest. A tool belt or gloves provide no fall protection.

126. C — Clearing the area below overhead work protects people from dropped objects, since even a small dropped tool from height can be lethal. Tool tethers and cordoning support this.

127. C — A pre-rig inspection verifies supports, clamps, and safety cables before raising a load. It is the final check before trusting the rig, especially over people.

128. D — Motors draw several times their running current at startup (inrush), which generator sizing must accommodate. Ignoring it can cause voltage sag or stalling.

129. B — A single-line diagram lets a planner verify service capacity and overcurrent coordination at a glance, along with grounding and feeder sizing. It communicates the power system's structure.

130. C — A long feeder run that meets ampacity but delivers low voltage is governed by voltage drop. The longer the run, the more likely voltage drop dictates the size.

131. B — Administering inventory prevents missing equipment from being discovered at load-in, when there is no time to recover. A complete, cross-checked shop order with spares prevents this.

132. A — A buck/boost transformer corrects voltage slightly below (or above) equipment requirements, such as boosting 208 V toward 230 V. It makes small corrections, not large transformations.

133. A — The ampacity calculation prevents a conductor from overheating at a given current. Voltage drop instead determines whether the delivered voltage is adequate.

134. B — Applying load diversity too aggressively risks overload when many loads run full at once, such as during a worst-case cue. Diversity must be conservative.

135. A — Overcurrent ratings must be verified against available fault current during planning, before installation. Under-rated devices create a severe arc-flash hazard.

136. A — The correct single-line sequence from the source is source, disconnect, overcurrent protection, distribution, then loads. This reflects how power actually flows.

137. D — Selective coordination ensures only the device nearest the fault opens, leaving the rest of the system energized. It keeps a localized fault from dropping the entire show.

138. C — A control/riser diagram communicates the control and data distribution layout — consoles, nodes, and network paths. It is used to wire the rig's data network.

139. A — Load diversity must never be applied to continuous or critical loads that genuinely run at full simultaneously. Doing so risks overload exactly when those loads peak.

140. A — A means of disconnect must be readily accessible and lockable for safety, maintenance, and emergencies. The company switch commonly serves this role.

141. B — Each node output port carries one DMX universe (512 channels) for the fixtures. A node typically provides several such ports.

142. C — A show floor power diagram shows power locations across an exhibit floor. It is particularly relevant to portable power distribution work.

143. A — Cable weight matters because a long run can weigh as much as the fixtures it serves. Omitting it from overhead calculations risks overloading the structure.

144. A — A feeder is the high-capacity cable from the source to the distribution equipment, the system's backbone. Branch circuits carry the final leg to fixtures.

145. B — Reconciling the plot, hookup, and single-line ensures the documents agree so the rig comes together correctly. Disagreements between documents cause errors at load-in.

146. C — The "10-foot" and "25-foot" references are permitted lengths of unprotected tap conductors under the NEC tap rules. The length limit prevents an undetected overload.

147. C — On a long run, a conductor must satisfy both ampacity and the acceptable voltage drop, and the larger required size governs. A conductor adequate for ampacity may still drop too much voltage.

148. A — A breaker's interrupting rating (AIC) must meet or exceed available fault current or it can rupture during a fault rather than interrupting. Ratings must always exceed available fault current.

149. C — Planning converts knowledge into a safe, documented, installable system, integrating load calculations, conductor sizing, grounding, and codes. It defines the practitioner who designs rather than merely installs.

150. D — A worst-case cue bringing many fixtures to full at once challenges the realistic application of load diversity, because the system must handle that momentary peak. Over-applying diversity risks overload at such moments.