LEVEL I — SIMULATION EXAM 6 (85 QUESTIONS)

Time Limit: 110 Minutes

Allowed References: NFPA 72 (2022), NFPA 70 (2020), Ugly's Electrical References (2020)

DOMAIN 1.1 — INSTALLATION (Questions 1–46)

1. A fire alarm technician is installing a smoke detector in a hotel room with an 8-foot smooth ceiling. The room measures 13 feet by 16 feet. A bathroom exhaust fan is mounted on the ceiling 2 feet from the planned detector location. Should the technician be concerned about the exhaust fan?

A. No, bathroom exhaust fans have no impact on smoke detector performance

B. Yes, the detector must be relocated at least 6 feet from any exhaust fan opening

C. Yes, the exhaust fan creates airflow that may pull smoke away from the detector

D. No, but only if the exhaust fan operates intermittently rather than continuously

2. A fire alarm technician receives a shipment of fire alarm cable marked "FPL" on the jacket. The project requires cable installation in three areas: a single-floor office ceiling with ducted return air, a vertical riser shaft serving four floors, and a ceiling space used as a return air plenum. In which of these three areas can the FPL cable be used?

A. Only in the single-floor office ceiling with ducted return air

B. In both the office ceiling and the riser shaft but not the plenum

C. In all three areas because FPL is a universal fire alarm cable type

D. In none of the three areas because FPL requires conduit in all installations

3. A fire alarm system has a total standby current of 0.9 amps and a total alarm current of 6.2 amps. The system has no emergency generator. Using standard NFPA 72 requirements with a 20% safety factor, what is the minimum battery capacity?

A. 21.6 Ah based on standby calculation without including alarm duration

B. 22.12 Ah using the correct formula but applying only a 10% safety factor

C. 24.0 Ah rounded to the nearest whole number without applying safety factor

D. 26.54 Ah after applying standby, alarm, and the required 20% safety factor

4. A fire alarm technician is installing notification appliances in a new school building. The architect has specified that all notification appliances must be vandal-resistant models with tamper-proof mounting hardware. During installation, the technician discovers that the approved horn/strobe devices do not include tamper-proof screws. What should the technician do?

A. Install the devices with standard screws since the specification is an aesthetic preference

B. Document the discrepancy and obtain direction from the project manager before proceeding

C. Purchase aftermarket tamper-proof screw kits and install them without further consultation

D. Substitute a different manufacturer's vandal-resistant model that includes tamper-proof hardware

5. A fire alarm technician is calculating conduit fill for a 1-inch EMT conduit. The technician plans to install eight 14 AWG THHN conductors and four 18 AWG THHN conductors. Per NEC Annex C Table C1, the maximum number of 14 AWG THHN in 1-inch EMT is 22, and the maximum for 18 AWG THHN alone is 40. Can all twelve conductors fit in the 1-inch conduit?

A. Yes, because each conductor type is individually below its respective maximum count

B. No, mixed conductor sizes require a manual calculation using individual conductor areas from Table 5

C. Yes, because the total of twelve conductors is well below the maximum for either size alone

D. No, because different wire sizes cannot share the same conduit per NEC Article 760

6. A fire alarm technician is installing smoke detectors in a building with a waffle-slab concrete ceiling. The ceiling has a grid pattern of 2-foot-square recessed coffers that are 6 inches deep. How does this ceiling type affect detector placement?

A. No adjustment is needed because waffle-slab coffers are less than 12 inches deep

B. Detectors must be mounted on the underside of the coffer ribs rather than within the coffers

C. Each coffer may act as a beam pocket requiring detectors within individual coffers per NFPA 72

D. The ceiling must be treated as a smooth flat surface using the bottom of the coffers as reference

7. In an addressable fire alarm system, the panel polls each device on the SLC approximately 10 times per minute. A device fails to respond to three consecutive poll attempts. What action does the panel take?

A. The panel generates a trouble signal indicating a communication failure for that device address

B. The panel activates the notification appliances for the zone containing the failed device

C. The panel reduces the polling rate to once per minute to give the device time to recover

D. The panel deactivates the device and removes it from the polling sequence permanently

8. A fire alarm technician is installing a fire alarm panel on a wall in an electrical room. The wall is concrete masonry unit construction. The technician needs to secure the panel's backbox to the wall. Which fastener type is most appropriate?

A. Wood screws driven directly into the mortar joints between the concrete blocks

B. Self-tapping sheet metal screws driven into pre-drilled holes in the block face

C. Toggle bolts inserted through the hollow cores of the concrete masonry blocks

D. Concrete expansion anchors or tapcon screws rated for the panel's weight and the wall material

9. A fire alarm technician is installing cable through a conduit that runs from inside the building to an exterior junction box mounted on the outside wall. The exterior junction box is exposed to weather including rain, snow, and temperature extremes. What type of junction box is required for this exterior location?

A. A standard indoor junction box with a weatherproof cover plate installed over the opening

B. A PVC plastic junction box because it is naturally corrosion-resistant in outdoor environments

C. A standard indoor junction box is acceptable if the cable entering the box is plenum-rated

D. A weatherproof (NEMA 3R or 4) rated junction box suitable for wet and outdoor locations

10. A fire alarm panel has two SLC loops. SLC 1 serves floors 1 through 5 and SLC 2 serves floors 6 through 10. During commissioning, the technician discovers that three smoke detectors on the seventh floor are connected to SLC 1 instead of SLC 2. The devices function and communicate with the panel. Should this be corrected?

A. Yes, the wiring must be corrected to match the approved shop drawings and device schedule

B. No, since the devices function correctly the SLC assignment is not operationally significant

C. No, but the shop drawings should be revised to reflect the as-installed circuit assignment

D. Yes, but only if the SLC 1 loop is approaching its maximum device capacity limit

11. A fire alarm technician is installing a combination heat and smoke detector in a room that has both a cooking area and computer equipment. The device uses multi-criteria detection with smoke, heat, and CO sensing. What advantage does this combination device offer over a single-technology detector?

A. It operates at a lower voltage than single-technology detectors reducing circuit loading

B. It provides faster response time than any single detector technology in all fire scenarios

C. It analyzes multiple environmental inputs to reduce nuisance alarms while maintaining detection

D. It eliminates the need for periodic sensitivity testing required by NFPA 72 Chapter 14

12. A fire alarm technician is running fire alarm cable alongside data network cables in a shared cable tray. The fire alarm cable is FPLP and the data cables are Category 6 plenum-rated. The technician's coworker claims this installation violates NEC separation requirements. Is the coworker correct?

A. Yes, fire alarm cable must always be in a separate cable tray from all other building systems

B. No, PLFA cables may share cable trays with other power-limited cables under certain conditions

C. Yes, because Category 6 cables operate at frequencies that interfere with fire alarm signals

D. No, because cable trays are classified as open wiring and NEC separation rules do not apply

13. A fire alarm technician is connecting the wiring for an addressable duct smoke detector. The detector has four terminal connections: two for the SLC (data in/data out) and two for a remote alarm LED indicator mounted outside the duct. The LED terminal connections must be wired to what?

A. A separate pair of conductors that connects the remote LED to the addressable device

B. The notification appliance circuit so the LED illuminates during any building alarm condition

C. The panel's auxiliary relay output programmed to activate when the duct detector alarms

D. The SLC conductors in parallel with the data connections for integrated communication

14. A fire alarm technician needs to install a smoke detector near the top of a stairwell in a 5-story building. The stairwell is open from the first floor to a skylight at the roof. The distance from the highest landing to the ceiling at the skylight is approximately 40 feet. What detection consideration applies?

A. A standard spot-type detector at the top of the stairwell will provide adequate coverage

B. Two spot-type detectors must be installed at different heights in the stairwell for redundancy

C. The stairwell requires no detection because stairwells are classified as exit passageways

D. Alternative detection such as a beam detector or projected beam unit may be needed at this height

15. A fire alarm technician is installing conduit from a fire alarm panel to a remote annunciator located 300 feet away. The conduit run requires six 90-degree bends. How many pull boxes must be installed in this run at minimum?

A. None, because the total bend count is below the maximum permitted between pull points

B. One pull box because six 90-degree bends equals 540 degrees requiring one intermediate point

C. Two pull boxes to divide the 540 degrees into three segments each below 360 degrees

D. Three pull boxes because the NEC limits conduit runs to two 90-degree bends between points

16. A fire alarm technician is mounting a ceiling-mounted smoke detector using a twist-lock base. After securing the base to the junction box and connecting the wiring, the technician twists the detector head into the base. What should be verified before leaving the device location?

A. That the detector's sensitivity has been adjusted to match the room's environmental conditions

B. That the detector head is fully seated and locked in the base with the retention mechanism engaged

C. That the detector's LED indicator is continuously illuminated showing normal standby status

D. That the detector has been tested with aerosol smoke before mounting to verify functionality

17. A fire alarm technician is installing a fire alarm system in a warehouse with 30-foot ceilings and steel bar joist construction. The steel deck above the joists is corrugated. Spot-type smoke detectors are specified for the open warehouse area. What installation challenge does this environment present?

A. Smoke may stratify before reaching ceiling-mounted detectors due to the high ceiling height

B. The corrugated deck makes it impossible to mount any type of smoke detector at ceiling level

C. Steel construction creates electromagnetic interference that prevents detector communication

D. The bar joist spacing is too narrow to install standard detector bases between the joists

18. A fire alarm system requires a dedicated branch circuit from the electrical distribution panel. The electrician asks the fire alarm technician what circuit characteristics are required. Which of the following is NOT a requirement for this circuit?

A. The circuit must be permanently identified at the electrical distribution panel

B. The circuit must include a lock-on device on the circuit breaker handle

C. The circuit must be dedicated and not shared with any other building loads

D. The circuit must be protected by a ground-fault circuit interrupter for safety

19. A fire alarm technician discovers during installation that a beam pocket in a concrete ceiling is 18 inches deep and 4 feet wide. A smoke detector was planned for the center of this beam pocket per the shop drawings. Is this placement correct?

A. No, the detector must be placed at the edge of the beam pocket near the beam face

B. Yes, detectors in beam pockets should be placed at the center of the pocket per NFPA 72

C. No, beam pockets deeper than 12 inches require heat detectors instead of smoke detectors

D. Yes, but only if the beam pocket is wider than the detector's listed spacing value

20. Using the power formula $P = V \times I$, a fire alarm technician determines that a NAC circuit operating at 24 VDC with 2.8 amps of alarm current consumes how many watts?

A. 8.57 watts calculated by dividing the voltage by the current

B. 26.8 watts calculated by adding the voltage and current together

C. 67.2 watts calculated by multiplying the voltage by the alarm current

D. 576 watts calculated by squaring the voltage and dividing by the current

21. A fire alarm technician is installing an addressable fire alarm system in a 2-story retail building. The SLC loop exits the panel on the first floor, serves all first-floor devices, continues to the second floor through a riser, serves all second-floor devices, and returns to the panel through a separate riser. This wiring configuration provides what circuit classification?

A. Class A because the SLC forms a complete loop with a separate return path to the panel

B. Class B because the SLC serves two floors and Class A is only for single-floor installations

C. Class C because the circuit uses two separate risers for the outgoing and return paths

D. Class B because any circuit that passes through a riser is automatically classified as Class B

22. A fire alarm technician measures the resistance at the panel terminals of a conventional IDC. The meter reads 0 ohms. The panel displays "ALARM — ZONE 2" but no fire condition exists. What fault does this reading indicate?

A. An open circuit on Zone 2 removing the EOLR from the panel's supervision circuit

B. A ground fault on Zone 2 creating an unintended path between the conductor and ground

C. The EOLR has been removed from the circuit leaving the panel without a supervision reference

D. A short circuit on Zone 2 where the two conductors are making contact with each other

23. A fire alarm technician is installing a visible notification appliance in a hotel corridor that is 8 feet wide and 180 feet long. Per NFPA 72, visible appliances must be within 15 feet of each end and spaced no more than 100 feet apart. What is the minimum number of strobes required?

A. Two strobes — one near each end of the corridor with a maximum 150-foot spacing

B. Three strobes — one near each end and one at the midpoint to satisfy both requirements

C. Four strobes — spaced at 45-foot intervals throughout the corridor length

D. Five strobes — one every 36 feet to ensure complete coverage without dead zones

24. A fire alarm technician is calculating voltage drop on a NAC circuit. The circuit uses 14 AWG copper, has a round-trip distance of 600 feet, and carries 2.0 amps during alarm. Per NEC Chapter 9 Table 8, the resistance of 14 AWG copper is 3.14 ohms per 1,000 feet. What is the voltage at the farthest device on a 24 VDC circuit?

A. 20.23 VDC after subtracting the 3.77-volt drop from the source voltage

B. 24.0 VDC because voltage drop is negligible on circuits under 1,000 feet

C. 17.86 VDC which falls below the minimum listed operating voltage of most devices

D. 22.12 VDC after applying a 50% derating factor to the calculated voltage drop

25. A fire alarm technician installs a smoke detector at the intersection of a T-shaped corridor. The detector is placed at the junction point where all three corridor legs meet. Is this an optimal placement?

A. No, the junction creates excessive airflow turbulence that prevents smoke from reaching the detector

B. No, the detector must be placed in one corridor leg only to provide clear zone identification

C. Yes, the junction point allows the detector to monitor smoke approaching from all three corridor legs

D. Yes, but only if the detector is a multi-criteria type that can handle the cross-ventilation conditions

26. A fire alarm technician is installing fire alarm devices and discovers that the contractor who installed the suspended ceiling used non-accessible ceiling tiles that are glued in place rather than laid in a standard grid. Above-ceiling fire alarm junction boxes need to be accessible. What must be done?

A. The junction boxes may remain above the glued tiles if they are documented on the as-built drawings

B. Access panels must be installed in the ceiling near each junction box to provide required access

C. All junction boxes must be relocated below the ceiling and surface-mounted on the finished side

D. The glued ceiling tiles must be replaced with standard removable tiles throughout the building

27. Per NFPA 72, what is the maximum area that a single fire alarm zone may cover in a building with standard (non-high-rise) construction?

A. 10,000 square feet per zone for any occupancy type regardless of building configuration

B. 15,000 square feet per zone when the building is fully protected by automatic sprinklers

C. There is no maximum square footage per zone specified in NFPA 72 for standard construction

D. 22,500 square feet per zone and zones should not cross fire walls or floor boundaries

28. A fire alarm technician is connecting the secondary battery wiring to a fire alarm panel. The panel's battery terminals are clearly marked with "+" and "−" polarity indicators. What happens if the technician accidentally reverses the battery polarity?

A. Reverse polarity can damage the panel's charging circuitry and must be connected correctly

B. The panel will operate normally because modern panels include automatic polarity correction

C. The batteries will charge at double the normal rate until the polarity is manually corrected

D. The panel will generate a trouble signal but continue to operate on primary AC power only

29. A fire alarm technician is installing pull stations in a building with two main exit doors and four secondary exit doors on the same floor. Per NFPA 72, pull stations are required within 5 feet of each exit. What is the minimum number of pull stations required on this floor?

A. Two pull stations — one at each main exit door only since secondary exits are supplementary

B. Four pull stations — one at each secondary exit since main exits have automatic detection

C. Six pull stations — one within 5 feet of each exit door regardless of its classification

D. Three pull stations — one at each main exit and one at the most centrally located secondary exit

30. A fire alarm technician is installing cable in a building and reaches a fire-rated floor assembly. The conduit penetrates the floor to reach devices on the floor below. After installing the conduit through the floor penetration, what must be done before the installation is considered complete?

A. The conduit must be tested for continuity to verify it is properly grounded through the floor

B. A pull box must be installed on each side of the floor penetration for future maintenance

C. The conduit must be secured with a seismic brace within 12 inches of the floor penetration

D. The penetration must be sealed with an approved firestop to maintain the floor's fire rating

31. A fire alarm panel's SLC output has a maximum rated capacity of 159 addressable devices. The current system has 140 devices on the loop. A building renovation will add 25 new smoke detectors. How should the technician address this situation?

A. Install all 25 new detectors on the existing loop since 165 is close to the maximum capacity

B. Notify the supervisor that the loop capacity will be exceeded and an additional SLC loop is needed

C. Use conventional IDC wiring for the 25 new detectors instead of addressable SLC devices

D. Remove 6 existing devices to make room for the 25 new devices within the 159-device limit

32. A fire alarm technician is installing a spot-type heat detector in a mechanical room with a 16-foot ceiling. The detector has a listed spacing of 50 feet. Per NFPA 72 Table 17.6.3.5.1, higher ceilings require reduced spacing for heat detectors. What principle does this spacing reduction address?

A. Hot air cools as it rises, requiring closer detector spacing to detect a weakened thermal signal

B. Higher ceilings increase the speed at which hot air reaches the detector requiring faster response

C. Wider spacing is needed at higher ceilings because heat distributes over a larger ceiling area

D. The spacing reduction applies only to rate-of-rise detectors and not to fixed-temperature types

33. A fire alarm technician is verifying the polarity of a notification appliance circuit at a horn/strobe device location. The technician measures +24 VDC with the red lead on the positive terminal and the black lead on the negative terminal. The circuit is currently in standby. What does this measurement indicate?

A. The circuit is in alarm condition because voltage is present on the NAC terminals in standby

B. The measurement is invalid because NAC circuits should read 0 VDC during standby

C. The NAC has supervision voltage applied which is normal for panels that supervise NACs in standby

D. The polarity is reversed because positive voltage should appear on the negative terminal in standby

34. A fire alarm technician is running fire alarm conduit through a space occupied by another contractor's equipment. The other contractor has installed a large variable frequency drive (VFD) motor controller on the wall. The fire alarm conduit will pass within 6 inches of the VFD enclosure. What concern should the technician address?

A. VFDs generate heat that can damage fire alarm conductor insulation at close proximity

B. VFDs contain hazardous chemicals that create a corrosive atmosphere near the enclosure

C. The VFD enclosure must be bonded to the fire alarm conduit for equipotential grounding

D. VFDs generate electromagnetic interference that can affect fire alarm circuit signal integrity

35. A fire alarm technician is installing cable and discovers that the planned conduit route passes directly through the center of a return air duct. The project drawings show the conduit penetrating both sides of the duct. Is this installation acceptable?

A. No, conduit cannot penetrate ductwork and must be rerouted around the duct

B. Yes, as long as the conduit is sealed at both duct penetrations to prevent air leakage

C. Yes, because metallic conduit provides adequate protection for cables inside ductwork

D. No, unless the conduit is wrapped with fire-resistant insulation throughout the duct interior

36. A fire alarm system uses an analog addressable panel. The panel's detector sensitivity report shows that a smoke detector has a current reading of 0.8% obscuration per foot. The manufacturer's acceptable range is 0.5% to 3.7%. The detector was last tested two years ago with a reading of 0.6%. What does the increasing trend suggest?

A. The detector is approaching its maximum sensitivity and will soon generate nuisance alarms

B. The trend indicates a catastrophic sensor failure requiring immediate device replacement

C. The gradual increase from 0.6% to 0.8% indicates normal drift from dust accumulation over time

D. The detector must be immediately removed from service because any upward trend is unacceptable

37. A fire alarm technician is installing a fire alarm system in a building with an open atrium that extends from the ground floor through the roof — a total height of 60 feet. The design calls for beam smoke detectors at multiple elevations within the atrium. What is the primary advantage of beam detectors in this application?

A. Beam detectors are less expensive than the number of spot detectors needed for this space

B. Beam detectors can protect large open volumes where spot detectors may be ineffective due to height

C. Beam detectors are immune to false alarms from dust, moisture, and airborne contaminants

D. Beam detectors do not require periodic testing and provide maintenance-free detection coverage

38. A fire alarm technician is wiring a conventional waterflow switch to an IDC on a conventional fire alarm panel. The waterflow switch has normally open contacts. When water flows, the contacts close. How does the panel detect the alarm condition from this switch?

A. The switch closure changes the IDC resistance which the panel interprets as an alarm

B. The switch generates a digital pulse signal that the panel decodes as a waterflow event

C. The switch closure activates an internal solenoid that sends an alarm tone to the panel

D. The closing contacts short across the IDC conductors changing the circuit's electrical characteristics

39. A fire alarm technician is installing a pull station at an exit door in a psychiatric care facility. The facility administrator requests a pull station that requires two separate actions to activate to prevent patients from triggering false alarms. What type of pull station meets this requirement?

A. A dual-action pull station requiring two motions such as lifting a cover then pulling the handle

B. A key-operated pull station that requires a special key to unlock before the handle can be pulled

C. A delayed-action pull station with a built-in 30-second timer before the alarm signal is generated

D. A staff-only pull station mounted at 60 inches above the floor accessible only to standing adults

40. A fire alarm technician is installing fire alarm cable and has a choice between using individual conductors in conduit or using a multi-conductor fire alarm cable. For a typical SLC installation in an addressable system, which approach is more common?

A. Individual THHN conductors in conduit are always required for SLC installations

B. Either method is acceptable but individual conductors offer better electromagnetic shielding

C. Multi-conductor fire alarm cable (such as 2-conductor shielded) is the more common approach

D. The NEC requires multi-conductor cable for SLC circuits and prohibits individual conductors

41. A fire alarm technician is installing an addressable system and needs to connect a conventional 120 VAC relay to the fire alarm system for HVAC shutdown. The relay must activate when the panel sends a command. What addressable device connects the panel's SLC to the conventional relay?

A. A monitor module that accepts the relay's contact closure and reports it to the panel

B. A control module that receives a command from the panel and closes contacts to activate the relay

C. An isolation module that protects the panel's SLC from the relay's 120 VAC circuit

D. A relay module that converts the SLC's digital signal to a 120 VAC power output

42. A fire alarm technician is calculating the battery requirement for a fire alarm system with the following specifications: standby current 0.45 amps, alarm current 3.8 amps, 24 hours standby, 15 minutes alarm (voice evacuation system), and 20% safety factor. What is the minimum battery capacity?

A. 13.69 Ah using the standard 5-minute alarm duration instead of the specified 15 minutes

B. 12.96 Ah without including the alarm current component in the calculation

C. 18.61 Ah using a 10% safety factor instead of the required 20% factor

D. 20.52 Ah after correctly applying all values including the 15-minute alarm duration

43. A fire alarm technician is installing detectors in a room that contains a residential-style kitchen area with a stove, microwave, and toaster oven. The room also contains office cubicles. What detection strategy is most appropriate?

A. Install a heat detector near the cooking appliances and smoke detectors in the office area

B. Install smoke detectors throughout the entire room including directly above the cooking area

C. Install only heat detectors throughout the room to eliminate all cooking-related nuisance alarms

D. Install a single multi-criteria detector centrally located to cover both the kitchen and office areas

44. Per NEC Article 760, power-limited fire alarm cables installed in a building without being enclosed in a raceway must comply with which requirement when installed in exposed locations below 7 feet?

A. The cable must be tagged with "FIRE ALARM" labels at intervals not exceeding 10 feet

B. The cable must be installed in a raceway to protect it from physical damage

C. The cable must be secured to the wall surface with staples at intervals not exceeding 12 inches

D. The cable must be a minimum of 16 AWG to withstand physical contact without damage

45. A fire alarm technician is installing an exterior waterproof pull station on the outside of a building near an emergency exit. The pull station is rated NEMA 4X for outdoor use. What additional installation consideration applies to exterior pull stations?

A. The pull station must be protected from direct sunlight to prevent UV degradation of the housing

B. The pull station must be mounted at the same height range as interior units (42–48 inches)

C. Exterior pull stations must have a separate dedicated circuit from interior pull stations

D. The conduit entry to the pull station must include weep holes to allow moisture drainage

46. A fire alarm technician is connecting a fire alarm panel to the building's grounding system. Per NEC Article 250, the panel's metal enclosure must be connected to the equipment grounding conductor. What is the purpose of this grounding connection?

A. To provide a reference point for the panel's SLC communication protocol signals

B. To enable the panel to detect ground faults on fire alarm circuits through comparison

C. To provide a low-impedance fault current path that trips the breaker during an enclosure fault

D. To reduce electromagnetic interference from nearby power circuits affecting panel operation

DOMAIN 1.2 — MAINTENANCE (Questions 47–82)

47. A fire alarm technician responds to a trouble call at a high-rise building. The panel displays "TROUBLE — NAC 4 — SHORT." The technician measures the resistance at the NAC 4 panel terminals and reads 0.3 ohms. What is the correct interpretation?

A. The NAC 4 conductors are shorted together somewhere on the circuit creating a near-zero resistance path

B. The end-of-line resistor on NAC 4 has failed open and the panel cannot detect the supervision reference

C. A notification appliance on NAC 4 has an internal short that is pulling down the circuit resistance

D. The 0.3-ohm reading is the normal wire resistance for the NAC 4 circuit length

48. During semiannual smoke detector testing in a hospital, the fire alarm technician must coordinate testing with hospital staff. Which of the following is the most important coordination step?

A. Scheduling testing during visiting hours so that visitors can assist with evacuation if needed

B. Testing only detectors in unoccupied patient rooms to minimize disruption to care

C. Coordinating with nursing staff so they can manage patient notification and prevent panic

D. Disconnecting all notification appliances in patient areas before any detector testing begins

49. A fire alarm technician is performing annual testing on an addressable system. When activating a smoke detector at address 075, the panel displays "ALARM — HEAT DETECTOR — ADDRESS 075 — CORRIDOR 3B." The technician is testing a smoke detector, not a heat detector. What type of error does this represent?

A. The device at address 075 has been physically swapped — a heat detector is installed where a smoke detector should be

B. The panel's SLC communication board is confusing device types due to a firmware bug

C. The panel is displaying the wrong device type because of electromagnetic interference on the SLC

D. The panel programming has the wrong device type assigned to address 075

50. A fire alarm system in a 5-story office building has been in service for 8 years. The building owner asks the fire alarm technician whether the smoke detectors need to be replaced based on age alone. Per NFPA 72, what is the code's position on detector replacement based on age?

A. NFPA 72 requires all smoke detectors to be replaced every 5 years regardless of condition

B. NFPA 72 does not specify a fixed replacement age but requires detectors to maintain listed sensitivity

C. NFPA 72 requires replacement at 10 years for ionization and 15 years for photoelectric types

D. NFPA 72 defers entirely to the manufacturer's published replacement schedule with no code requirement

51. A fire alarm technician is troubleshooting a ground fault on an IDC in a conventional system. After disconnecting the circuit at the panel, the technician uses a megger to test between each conductor and ground. Conductor 1 reads 550 MΩ to ground. Conductor 2 reads 0.8 MΩ to ground. What do these readings indicate?

A. Conductor 2 has compromised insulation creating an unintended path to ground

B. Both conductors are within acceptable range for fire alarm circuit insulation resistance

C. Conductor 1 has excessive insulation resistance indicating a conductor material defect

D. The megger is malfunctioning because both conductors should read identical values

52. During annual testing of a fire alarm system, the technician tests the panel's primary-to-secondary power transfer. When AC power is disconnected, the panel transfers to battery and operates normally for 5 minutes. The technician then reconnects AC power. The panel returns to AC operation, but the battery charger indicator does not illuminate. What does this suggest?

A. The batteries are fully charged and the charger has entered a rest mode to prevent overcharging

B. The charger will activate after a 30-minute delay to protect the batteries from rapid recharging

C. The panel's AC power detection circuit is functioning but the charger circuit has a separate fault

D. The battery charger circuit may have a fault and the batteries are not being recharged

53. A fire alarm technician discovers during inspection that a smoke detector in a stairwell has been covered with a clear plastic bag by building maintenance to prevent dust contamination during ongoing construction on an adjacent floor. The construction has been underway for three months. What concern should be raised?

A. Clear plastic bags do not affect smoke detection and the detector remains fully functional

B. The detector has been effectively disabled for three months leaving the stairwell unprotected

C. The plastic bag is an acceptable temporary measure as long as it is removed within six months

D. The detector should be replaced with a heat detector for the duration of the construction period

54. A fire alarm technician is testing visible notification appliances and measures the flash rate of a strobe using a stopwatch. The strobe flashes once every 1.5 seconds. Per NFPA 72, is this flash rate compliant?

A. Yes, the flash rate of approximately 0.67 flashes per second is within the 1 to 2 flashes per second range

B. No, the flash rate must be exactly 1 flash per second with zero tolerance for variation

C. Yes, but only if all other strobes in the building flash at the same 1.5-second interval

D. No, 0.67 flashes per second is below the minimum of 1 flash per second required by NFPA 72

55. A fire alarm system's event log shows that the system has been generating "AC POWER FAILURE" trouble signals every evening at approximately 11:00 PM and restoring at approximately 6:00 AM. The building has normal utility power service. What is the most likely cause?

A. The building's electrical system has a scheduled power reduction during off-peak hours

B. The fire alarm panel's AC monitoring circuit has a temperature-sensitive component failure

C. A building timer or energy management system is turning off the fire alarm panel's circuit at night

D. The utility company reduces voltage during nighttime hours below the panel's minimum threshold

56. A fire alarm technician is performing a functional test on a pull station. After pulling the handle, the technician verifies the panel alarm and notification activation. The technician then needs to reset the pull station. How are most pull stations reset after activation?

A. By pushing the handle back to the normal position using firm upward pressure

B. By using a reset key or tool that releases the internal latching mechanism

C. By disconnecting and reconnecting the circuit at the nearest junction box

D. By pressing a reset button on the back of the pull station accessible through the backbox

57. During annual testing, a fire alarm technician tests the HVAC shutdown interface by activating a duct smoke detector. The AHU shuts down as expected. The technician resets the detector and the panel returns to normal. However, the AHU does not restart. The building engineer reports that the AHU requires a manual restart at the mechanical unit after any fire alarm shutdown. Is this an acceptable system response?

A. Yes, many AHU controllers require manual restart after fire alarm shutdown to prevent automatic recirculation of smoke

B. No, the AHU must automatically restart when the fire alarm system returns to normal status

C. Yes, but only if the HVAC system is less than 10 years old and uses digital controls

D. No, the fire alarm system must send a restart signal to the AHU upon system reset

58. A fire alarm technician is inspecting a fire alarm system and discovers that the panel's batteries are dated three years ago. The technician performs a load test and the batteries pass with adequate voltage under load. Should the batteries be replaced based on age?

A. Yes, fire alarm batteries must be replaced every two years regardless of test results

B. No, battery replacement is based on performance testing results rather than age alone

C. Yes, but only if the manufacturer's published replacement schedule specifies three years

D. No, fire alarm batteries have an industry-standard lifespan of ten years before replacement

59. A fire alarm system is generating a "DEVICE DIRTY — ADDRESS 044" trouble signal. The technician inspects the detector at address 044 and finds it mounted directly above a space heater vent. What is the most likely cause of the dirty device signal?

A. The space heater is generating electromagnetic interference that affects the detector's sensor

B. The heater's electrical current draw creates a power fluctuation that triggers the dirty signal

C. Warm air rising from the heater carries dust and particles into the detector's sensing chamber

D. The heater's thermostat cycling creates rapid temperature changes that the panel misinterprets

60. Per NFPA 72, when performing a functional test on an addressable smoke detector, the technician must verify that the panel displays which specific information?

A. The panel must display only the general zone location of the activated detector

B. The correct device address, device type, and programmed location descriptor

C. Only the alarm signal type and the time of activation without device-specific information

D. The detector's current analog sensitivity reading and its acceptable operating range

61. A fire alarm technician is troubleshooting an addressable system where five consecutive device addresses (031 through 035) are showing communication failures. All five devices are located in the same corridor. What troubleshooting approach is most efficient?

A. Inspect the SLC wiring in the corridor for a single fault that isolates all five devices

B. Replace all five devices simultaneously since they have likely failed as a group

C. Reprogram the panel to assign new addresses to the five non-communicating devices

D. Reset the panel to clear the communication failures and observe whether they return

62. During a fire alarm inspection, the technician discovers that the building's fire alarm system has no Record of Completion on file. The system was installed six years ago and has been tested annually since installation. What is the significance of this finding?

A. The missing Record of Completion is acceptable since annual testing records substitute for it

B. The system must be entirely retested as if it were a new installation to generate the document

C. Only the AHJ can determine whether a retroactive Record of Completion is needed

D. The Record of Completion is a code-required document and its absence is a documentation deficiency

63. A fire alarm technician discovers that a sprinkler system control valve is partially closed during a routine inspection. The tamper switch on the valve is generating a supervisory signal at the panel. The building owner is unaware of the valve position change. What actions must be taken?

A. Notify the building owner, fully open the valve, verify the supervisory signal restores to normal

B. Reset the panel to clear the supervisory signal without changing the valve position

C. Contact the sprinkler contractor to determine whether the valve was intentionally repositioned

D. Document the condition in the inspection report and schedule a follow-up visit to recheck

64. A fire alarm technician is testing notification appliances and discovers that a speaker in a voice evacuation system produces adequate volume but the pre-recorded message plays at double the normal speed, making the words unintelligible. What component is most likely causing this issue?

A. The speaker has an impedance mismatch with the amplifier causing audio distortion

B. The message generator or audio playback module has a fault affecting playback speed

C. The amplifier is operating at double its rated frequency response range

D. The speaker wire has excessive resistance creating a time-domain distortion effect

65. A fire alarm system displays a trouble signal for "BATTERY DISCONNECT." The technician opens the panel and finds that one battery wire has come loose from its terminal. After reconnecting the wire and tightening the terminal, what must the technician verify?

A. That the trouble signal clears and the battery charger indicator shows active charging

B. That the panel performs an automatic restart sequence to recalibrate the battery monitor

C. That both batteries are replaced since a disconnection event may have damaged the cells

D. That the panel's SLC communication is restored since battery disconnect affects SLC voltage

66. Per NFPA 72, how frequently must the fire alarm system's communication link to the supervising station be tested?

A. Monthly by transmitting a test signal and confirming receipt with the monitoring station

B. Semiannually as part of the comprehensive system functional testing schedule

C. Weekly by the building owner as a routine maintenance responsibility

D. Annually by transmitting a test signal and confirming receipt with the monitoring station

67. A fire alarm technician is performing semiannual testing and discovers that a smoke detector consistently activates when tested but takes noticeably longer to respond than other detectors of the same model on the same circuit. What does the delayed response suggest?

A. The detector may be approaching its listed sensitivity limits due to contamination buildup

B. The SLC polling rate for this specific device is slower than for other devices on the loop

C. The detector's address is conflicting with another device causing delayed panel processing

D. The longer response time is normal variation between individual detector manufacturing units

68. A fire alarm system in a warehouse generates nuisance alarms from smoke detectors approximately once per week. The alarms occur at random times and no fire condition is ever found. The warehouse stores cardboard boxes and has forklift traffic. What is the most probable cause?

A. The warehouse's structural vibrations from forklift traffic are shaking the detectors loose

B. Dust and cardboard particles stirred up by forklift movement are entering the detector chambers

C. The warehouse's HVAC system is distributing smoke from a neighboring building's exhaust

D. Electromagnetic interference from the forklifts' electric motors is triggering the detectors

69. During annual testing of a fire alarm system, the technician tests the fire door holder release function. The technician activates a smoke detector near a fire-rated door held open by a magnetic holder. The panel displays the alarm correctly and notification appliances activate. However, the door does not release from the magnetic holder. What should the technician investigate?

A. The smoke detector signal type to verify it is generating an alarm rather than a supervisory signal

B. The notification appliance circuit because the door holder may be powered from the same NAC

C. The control module output, the wiring to the door holder, and the magnetic holder itself

D. The door closer mechanism to verify it has sufficient spring tension to close the door

70. A fire alarm panel generates a trouble signal reading "SLC 1 — HIGH CURRENT." This trouble appeared after three new addressable devices were added to the loop yesterday. What does this trouble indicate?

A. The total current draw of all devices on SLC 1 has exceeded the loop's maximum rated current capacity

B. One of the three new devices has an internal short drawing excessive current from the SLC

C. The panel's SLC power supply needs a firmware update to support the three additional devices

D. The SLC conductors are too small to carry the additional current required by the new devices

71. Per NFPA 72 Table 14.4.3.2, how frequently must sealed lead-acid batteries receive a visual inspection?

A. Monthly to check for swelling, corrosion, and electrolyte leakage at the terminals

B. Annually as part of the comprehensive system inspection and testing cycle

C. Quarterly to coincide with the building's standard maintenance schedule

D. Semiannually to check for physical signs of degradation including swelling and corrosion

72. A fire alarm technician is testing a waterflow switch during semiannual inspection. The technician opens the inspector's test valve and water flows. After 90 seconds, no alarm signal has appeared at the panel. What should be documented?

A. The test is acceptable because 90 seconds is the maximum allowable response time

B. The waterflow switch has failed its functional test and must be repaired or replaced

C. The retard mechanism delay must be checked because it may be set too long

D. The test should continue for an additional 90 seconds before documenting a failure

73. A fire alarm system was installed two years ago. Sensitivity testing was performed at the one-year mark as required. The next sensitivity test is due at what interval?

A. At the two-year mark — one year after the initial sensitivity test was performed

B. At the four-year mark — two years after the last sensitivity test per annual schedule

C. At the three-year mark — following the alternate-year schedule from the initial test

D. At the five-year mark — three years after the last test because the interval increases

74. During inspection, the fire alarm technician discovers that building maintenance has installed a ceiling-mounted projector directly adjacent to a smoke detector. The projector's exhaust fan blows warm air across the detector's sensing chamber. What concern does this create?

A. The projector's fan noise exceeds the ambient decibel level affecting audible notification testing

B. The warm air current can carry dust particles into the detector causing nuisance alarms

C. The projector's light output interferes with the photoelectric sensing technology in the detector

D. The warm exhaust creates a thermal barrier that prevents smoke from reaching the detector

75. A fire alarm technician is testing a tamper switch on a sprinkler valve and turns the valve wheel two full revolutions from fully open. The panel generates an alarm signal rather than a supervisory signal. What does this indicate?

A. The tamper switch is programmed as an alarm point instead of a supervisory point in the panel

B. Two revolutions exceeds the threshold and the panel escalates the signal from supervisory to alarm

C. The tamper switch contacts are wired to the wrong zone input type on the fire alarm panel

D. Both A and C are valid possibilities — the switch may be mis-programmed or mis-wired

76. A fire alarm system's event log shows that a specific addressable module has generated 23 trouble signals over the past month with each trouble lasting only a few minutes before clearing. The module is a monitor module connected to a tamper switch on a sprinkler valve. What is the most likely cause?

A. The tamper switch has a manufacturing defect causing intermittent false supervisory signals

B. The valve is experiencing minor vibration or movement that intermittently activates the switch

C. The panel's SLC polling is too aggressive causing the module to reset repeatedly

D. The monitor module's address is conflicting with another device on the same SLC loop

77. A fire alarm technician performs a battery voltage measurement during an inspection and reads 25.8 VDC with the charger connected on a 24 VDC system. The technician's coworker says this is too low and the charger must be faulty. Is the coworker correct?

A. Yes, the minimum acceptable float voltage for a 24 VDC system is 27.0 VDC

B. No, 25.8 VDC is below the typical float range but may be acceptable during heavy standby load

C. No, 25.8 VDC is within an acceptable range for a 24 VDC system under certain conditions

D. Yes, any voltage below 27.0 VDC indicates the charger is not providing adequate output

78. A fire alarm technician discovers during annual testing that the panel's LCD display is dim and difficult to read. All other panel functions appear to operate normally. What should be documented?

A. The panel manufacturer's recommended maintenance includes display cleaning and brightness adjustment

B. The LCD display does not affect fire alarm system operation and is purely cosmetic

C. The panel must be immediately replaced because a dim display indicates processor failure

D. The dim display is a deficiency because operators and responders must be able to read panel information

79. During inspection of a fire alarm system installed in a restaurant, the technician finds that a smoke detector has been removed from its base in the kitchen area. A handwritten note on the base reads "Too many false alarms — removed by manager." What must be documented?

A. The missing detector is a critical deficiency and must be reinstalled or replaced with appropriate detection

B. The manager's action is acceptable because cooking environments are exempt from detection

C. The detector should be replaced with an identical model and reinstalled in the same location

D. The technician should install a temporary detector until the next scheduled annual inspection

80. A fire alarm technician is testing a fire alarm system's communication link. The technician transmits a test alarm signal from the panel. The supervising station reports receiving the signal after 45 seconds. Is this response time acceptable?

A. No, alarm signals must be received by the supervising station within 10 seconds of transmission

B. Yes, 45 seconds is within the acceptable signal transmission time for most communication technologies

C. No, alarm signals must be received within 30 seconds per NFPA 72 for all communication types

D. Yes, but only if the system uses a DACT communicator rather than IP or cellular technology

81. During annual testing, the fire alarm technician activates a duct smoke detector. The panel correctly displays the alarm. The HVAC unit shuts down. The technician also notices that the building's general alarm notification appliances activate. The building engineer says duct detectors should not activate building alarm. Who is correct?

A. The building engineer is always correct — duct detectors should never trigger general notification

B. The fire alarm technician should check the specifications — the response depends on the system design

C. Both are wrong — duct detectors must always activate general notification per NFPA 72

D. The system's sequence of operations determines whether duct detection triggers general alarm

82. A fire alarm technician is reviewing maintenance records and discovers that no testing has been performed on the fire alarm system's emergency control functions (elevator recall, HVAC shutdown, door release) for two years. Per NFPA 72, these functions should have been tested at what frequency?

A. Semiannually because emergency control functions are classified as critical safety interfaces

B. Every two years because emergency control functions are tested on an extended schedule

C. Annually as required by NFPA 72 Table 14.4.3.2 for all emergency control function interfaces

D. Only during initial acceptance testing with no periodic retesting required by NFPA 72

DOMAIN 1.3 — SUBMITTAL PREPARATION AND SYSTEM LAYOUT (Questions 83–85)

83. A fire alarm technician reviews a shop drawing and notices that the NAC voltage drop calculation shows 15.2 VDC at the farthest device on NAC 2. The notification appliances are listed for 16–33 VDC operation. What must the technician communicate to the project team?

A. NAC 2 will not deliver adequate voltage to the farthest devices and the circuit must be redesigned

B. The 15.2 VDC reading is within the normal tolerance range for end-of-circuit devices

C. The calculation is acceptable because the 20% safety factor will compensate for the low voltage

D. The appliances will operate at reduced output but remain functional at 15.2 VDC

84. A fire alarm device address schedule lists "Address 089 — Smoke Detector — Floor 3 — Room 312 — SLC 1 — Zone 3." What information from this entry would the technician need when programming the fire alarm panel?

A. Only the address number and the SLC assignment since the panel auto-detects device types

B. Only the floor and room number since the panel generates addresses automatically

C. The address number, device type, location descriptor, SLC assignment, and zone assignment

D. Only the zone assignment since all other information is determined by the physical wiring

85. A fire alarm system's as-built drawings show 145 devices on SLC 1 and 132 devices on SLC 2. During a recent renovation, 10 new detectors were added to SLC 1 but the as-built drawings were not updated. What is the current documented versus actual device count discrepancy?

A. SLC 1 shows 145 on drawings but actually has 155 installed — a 10-device documentation gap

B. SLC 1 now has 155 devices which must be reflected in updated as-built drawings

C. The discrepancy is acceptable because the total device count across both loops has not changed

D. The drawings do not need updating until the next scheduled annual inspection

LEVEL I — SIMULATION EXAM 6: ANSWER KEY AND EXPLANATIONS

1. C — Bathroom exhaust fans create localized airflow that can pull smoke away from a nearby smoke detector before the smoke enters the sensing chamber. This air movement delays or prevents detection by directing smoke toward the exhaust opening rather than allowing it to accumulate at the detector. The technician should evaluate the fan's airflow pattern and consider relocating the detector away from the fan's influence zone.

2. A — FPL (Fire Power-Limited General Purpose) cable is acceptable only in general-purpose locations that are not plenums and not risers. The single-floor office ceiling with ducted return air is not a plenum and does not involve a vertical multi-floor run, making it the only location where FPL can be used. The riser shaft requires FPLR minimum, and the plenum space requires FPLP.

3. D — Standby energy = 0.9 × 24 = 21.6 Ah. Alarm energy = 6.2 × 0.083 = 0.515 Ah. Subtotal = 22.115 Ah. With 20% safety factor: 22.115 × 1.20 = 26.54 Ah. The minimum battery capacity is 26.54 ampere-hours. Select the next available standard battery size above this calculated minimum.

4. B — When a specification requirement cannot be met with the approved products, the technician must document the discrepancy and obtain direction from the project manager. Specifications are contractual requirements, and deviations — even seemingly minor ones like screw types — must be formally addressed through the project's submittal or change order process rather than resolved unilaterally by the installer.

5. B — When different conductor sizes are installed in the same conduit, the pre-calculated Annex C tables cannot be used directly because those tables assume all conductors are the same size. A manual calculation must be performed using the individual conductor cross-sectional areas from NEC Chapter 9, Table 5 and the conduit's internal area from Table 4, applying the 40% fill limit for three or more conductors.

6. C — Waffle-slab ceiling coffers with 6-inch depth function similarly to beam pockets. The recessed coffers can trap smoke and prevent it from traveling freely to adjacent coffers where detectors are located. Per NFPA 72, coffers deeper than 4 inches may require individual detectors within each coffer depending on the coffer dimensions and depth relative to the flat portions of the ceiling.

7. A — When an addressable device fails to respond to multiple consecutive polling attempts, the panel generates a trouble signal indicating a communication failure for that specific device address. This alerts the building management and service technician that the device is not communicating

and requires investigation. The panel does not activate notification appliances for a communication failure — it reports it as a trouble condition.

8. D — Concrete expansion anchors (wedge anchors) or tapcon screws are the appropriate fasteners for securing heavy equipment like fire alarm panels to concrete masonry walls. These fasteners are specifically designed for concrete and masonry applications and provide the pullout resistance needed to support the panel's weight. Wood screws and sheet metal screws are not rated for concrete applications.

9. D — Exterior junction boxes exposed to weather must be rated for wet and outdoor locations — typically NEMA 3R (rainproof) or NEMA 4 (watertight) ratings. Standard indoor junction boxes are not sealed against moisture intrusion and will allow rain, snow, and condensation to reach the conductor terminations, causing corrosion, ground faults, and eventual circuit failure.

10. A — The wiring must be corrected to match the approved shop drawings and device schedule. Even though the devices function on SLC 1, the installation does not match the approved design documents. As-built discrepancies create confusion during future maintenance, complicate troubleshooting, and may affect the system's response programming if zone assignments are tied to specific SLC loops.

11. C — Multi-criteria detectors analyze inputs from multiple sensors — smoke, heat, and CO — using algorithms that compare environmental readings to distinguish real fire conditions from nuisance sources. A single cooking event produces smoke particles but no corresponding heat or CO increase, so the algorithm filters it out. A real fire produces correlated changes across multiple parameters, triggering the alarm.

12. B — NEC Article 760 permits power-limited fire alarm cables to share cable trays with other power-limited cables under certain conditions specified in Section 760.136. Category 6 plenum-rated data cables are typically classified as power-limited communications circuits. The specific separation requirements depend on the cable classifications involved, but the sharing is not universally prohibited.

13. A — The remote alarm LED indicator is a separate accessory that mounts outside the duct to provide visible alarm indication. It connects to the duct detector's dedicated LED terminals via a separate pair of conductors — not to the NAC, the SLC, or the panel's relay outputs. The LED is powered and controlled by the duct detector itself.

14. D — At approximately 40 feet from the highest landing to the skylight ceiling, spot-type smoke detectors may not be effective because smoke cools and decelerates as it rises, potentially stratifying before reaching the ceiling. Alternative detection technologies — such as projected beam detectors spanning the stairwell width at multiple elevations — should be considered to ensure reliable detection at this height.

15. C — Six 90-degree bends total 540 degrees. The NEC allows 360 degrees maximum between pull points. To divide 540 degrees into segments below 360 degrees each, a minimum of two pull boxes is needed — creating three segments of 180 degrees each (two bends per segment). Each pull box resets the bend count for the next conduit section.

16. B — After installing the detector head in the twist-lock base, the technician must verify that the head is fully seated and the retention mechanism is engaged. An improperly seated detector can lose communication with the panel, fall from the base, or fail to activate during a fire. The twist-lock mechanism must click or latch to confirm the detector is secure.

17. A — In a warehouse with 30-foot ceilings, smoke may stratify — forming a layer below the ceiling — as it cools during its rise. If the smoke layer stabilizes at a height below the ceiling-mounted detectors, the detectors may not activate because the smoke never reaches them. This stratification effect is one of the primary challenges of smoke detection in high-ceiling environments.

18. D — A ground-fault circuit interrupter is specifically prohibited on the fire alarm panel's dedicated branch circuit. GFCI protection can trip during ground fault conditions that do not represent a fire hazard, disconnecting primary power from the panel. The other three options — permanent identification, lock-on device, and dedicated circuit — are all code requirements.

19. B — NFPA 72 requires detectors placed within beam pockets to be centered within the pocket for maximum coverage of the trapped smoke volume. A detector at the edge or near the beam face would not effectively sense smoke that accumulates in the center of the pocket. Centering the detector within the 4-foot-wide, 18-inch-deep beam pocket provides the best detection coverage.

20. C — Using the power formula $P = V \times I$: $P = 24$ VDC $\times$ 2.8 amps = 67.2 watts. This calculation determines the power consumed by the NAC during alarm conditions. Power calculations are essential for sizing the panel's power supply, determining battery capacity, and verifying that the total system power demand does not exceed the power supply's rated output.

21. A — The SLC forms a complete loop — leaving the panel through one riser, serving all devices, and returning through a separate riser. This loop configuration with a physically separate return path provides Class A circuit performance. If an open fault occurs anywhere on the loop, the panel can communicate with all devices from the alternate direction.

22. D — A resistance reading of 0 ohms on a conventional IDC indicates a short circuit — the two conductors are making direct contact somewhere on the circuit. Many conventional panels interpret this near-zero resistance as a device activation because it mimics the electrical change produced when a conventional detector shorts across the IDC to signal an alarm. The short must be located and repaired.

23. B — Two strobes within 15 feet of each end would be approximately 150 feet apart, exceeding the 100-foot maximum spacing. Three strobes solve both requirements: one within 15 feet of each

end, plus one at approximately the midpoint. This creates spacings of approximately 75 feet and 90 feet, both within the 100-foot maximum.

24. A — Wire resistance = 600 feet × (3.14 / 1000) = 1.884 ohms. V_drop = 2.0 amps × 1.884 ohms = 3.77 volts. Voltage at farthest device = 24 − 3.77 = 20.23 VDC. This is above the typical 16 VDC minimum listed operating voltage for 24 VDC notification appliances, so the circuit is acceptable with adequate margin.

25. C — A T-shaped corridor junction is an optimal location for a smoke detector because smoke approaching from any of the three corridor legs will reach the detector at the intersection point. This placement provides effective coverage for all three corridor directions with a single device, maximizing detection coverage while minimizing device count.

26. B — NEC requires that all junction boxes remain accessible for future maintenance, inspection, and troubleshooting. When non-removable ceiling tiles prevent access to above-ceiling junction boxes, access panels must be installed in the ceiling at each junction box location. Simply documenting inaccessible boxes on as-built drawings does not satisfy the accessibility requirement.

27. D — NFPA 72 Section 23.8.5 establishes that fire alarm zones should generally not exceed 22,500 square feet and should not cross fire walls or floor boundaries. These zone size and boundary limitations ensure that alarm zone indications provide meaningful location information for emergency responders to identify the general area of alarm origin within the building.

28. A — Reverse battery polarity can damage the fire alarm panel's internal charging circuitry, battery monitoring circuits, and power supply components. Modern panels may include limited reverse polarity protection, but relying on this protection is not acceptable practice. Battery connections must always be verified for correct polarity before the terminals are tightened.

29. C — NFPA 72 Section 17.14 requires manual fire alarm stations within 5 feet of each exit doorway. This requirement applies to all exit doors regardless of whether they are classified as main or secondary exits. Six exit doors require a minimum of six pull stations — one within 5 feet of each door.

30. D — Any penetration through a fire-rated floor assembly must be sealed with an approved firestop material to maintain the floor's fire rating. An unsealed conduit penetration creates a path for fire, smoke, and toxic gases to travel between floors, compromising the building's vertical compartmentalization. Firestopping is required by building codes for all penetrations through fire-rated assemblies.

31. B — Adding 25 new devices to the existing 140 would bring the total to 165, exceeding the manufacturer's maximum SLC capacity of 159 devices. Operating an SLC beyond its rated capacity causes communication failures, polling timeouts, and unreliable device operation. An additional SLC loop must be added to accommodate the new devices.

32. A — Hot air produced by a fire cools as it rises through the room volume. At higher ceiling heights, the thermal energy has more distance to travel and more time to cool before reaching the detector. The weakened thermal signal requires closer detector spacing to ensure the reduced temperature rise at the ceiling is still sufficient to activate the heat detector.

33. C — Some fire alarm panels apply a supervision voltage to NAC circuits during standby to monitor circuit integrity — verifying that the circuit is continuous and the EOLR is present. A voltage reading on the NAC terminals during standby is normal for these panels. The NAC switches to full alarm voltage and current only when the panel activates the circuit during an alarm condition.

34. D — Variable frequency drives generate significant electromagnetic interference (EMI) from the high-frequency switching of power semiconductors. EMI can induce noise on fire alarm circuit conductors at close proximity, causing communication errors on SLC circuits, false readings on IDC circuits, and unreliable device operation. The conduit should be rerouted to maintain adequate separation from the VFD.

35. A — Conduit cannot penetrate ductwork because it would create unsealed holes in the duct, allow conditioned air to leak from the system, potentially distribute smoke through the duct system, and violate both NEC and mechanical code requirements. The conduit must be rerouted around the duct using an alternative path that avoids penetrating the duct walls.

36. C — A gradual sensitivity increase from 0.6% to 0.8% over two years represents normal drift caused by the slow accumulation of dust and particles in the detector's sensing chamber. Both readings remain well within the manufacturer's acceptable range of 0.5% to 3.7%. This is the type of progressive drift that sensitivity testing is designed to monitor — the detector requires routine observation but no immediate corrective action.

37. B — Beam smoke detectors project a light beam across large open spaces and detect smoke by measuring the reduction in light intensity at the receiver. They are specifically designed for large, open volumes where spot-type detectors may be ineffective due to extreme ceiling heights, smoke stratification, or impractical access for maintenance. A single beam detector can protect the wide-open atrium space effectively.

38. D — When the waterflow switch contacts close due to water flow, they short across the IDC conductors, changing the circuit's electrical characteristics from the normal EOLR resistance to near-zero resistance. The conventional panel detects this resistance change and interprets it as an alarm condition. This is the standard operating principle for conventional initiating device circuits.

39. A — A dual-action pull station requires two distinct physical motions to activate — such as lifting a protective cover and then pulling the handle. This design reduces accidental and malicious false activations in environments where vulnerable populations may interact with the devices. Dual-action stations are commonly specified in schools, psychiatric facilities, and detention environments.

40. C — Multi-conductor fire alarm cable — such as 2-conductor shielded cable — is the most common approach for SLC installations in addressable systems. The cable provides the two conductors needed for the SLC communication loop in a single jacketed assembly that is easier to install, identify, and manage than individual conductors. The shielding helps protect the digital communication signals from electromagnetic interference.

41. B — A control module receives commands from the panel over the SLC and activates an output — typically a set of dry relay contacts. When the panel commands the module to activate, the contacts close, completing the circuit that energizes the 120 VAC relay coil for HVAC shutdown. The control module provides the interface between the panel's low-voltage digital SLC and the conventional relay circuit.

42. D — Standby energy = (0.45 × 24 + 3.8 × 0.25) × 1.20 = (10.8 + 0.95) × 1.20 = 11.75 × 1.20 = 14.10 Ah. The system requires a minimum of 14.10 Ah — select the next standard battery size above this value. Voice evacuation systems require 15 minutes of alarm instead of the standard 5 minutes, which significantly increases the alarm energy component.

43. A — The most appropriate strategy combines detection technologies matched to each environment within the room. Heat detectors near the cooking appliances avoid nuisance alarms from cooking fumes while still providing detection for a stove fire. Smoke detectors in the office area provide early warning sensitivity where cooking contamination is unlikely to reach. This combination maximizes detection effectiveness while minimizing false alarms.

44. B — NEC Article 760 requires that power-limited fire alarm cables installed in exposed locations below 7 feet above the floor — where they are subject to physical damage from contact with equipment, materials, or personnel — be protected by a raceway. Exposed cable at this height without raceway protection is vulnerable to damage that could compromise circuit integrity.

45. B — Exterior pull stations must comply with the same mounting height requirements as interior units — between 42 and 48 inches above the finished surface, measured to the handle or operating mechanism. The NEMA 4X weatherproof rating addresses environmental protection, but the mounting height and placement requirements from NFPA 72 Section 17.14 apply equally to interior and exterior installations.

46. C — The equipment grounding conductor provides a low-impedance fault current path from the panel's metal enclosure back to the electrical service entrance. If a fault occurs — such as a hot conductor contacting the metal enclosure — the fault current flows through the grounding conductor and trips the circuit breaker, removing the hazard. Without this path, the enclosure could become energized, creating a shock hazard for anyone who touches it.

47. A — A resistance reading of 0.3 ohms on a NAC circuit indicates that the two conductors are shorted together, creating a near-zero resistance path. This short bypasses the normal circuit resistance including all notification appliances and the EOLR. The panel detects this abnormally

low resistance and reports it as a short circuit trouble condition. The short must be located and repaired.

48. C — Coordinating with nursing staff is the most critical step because hospital staff must manage patient awareness, prevent panic, and be prepared to respond if a patient's medical condition is affected by alarm activation. Staff can inform patients about the testing in advance, monitor vulnerable patients during testing, and ensure that the fire response protocol is not inadvertently triggered during testing activities.

49. D — When the panel displays the wrong device type — "Heat Detector" instead of "Smoke Detector" — for an address that the technician is physically testing as a smoke detector, the most likely cause is a programming error. The panel's device database has the wrong device type assigned to address 075. The programming must be corrected to show the correct device type for accurate identification during alarm events.

50. B — NFPA 72 does not specify a fixed replacement age for smoke detectors. Instead, the code requires that detectors maintain their sensitivity within the manufacturer's listed range throughout their service life, as verified through periodic sensitivity testing per Table 14.4.3.2. Detectors that can no longer maintain acceptable sensitivity after cleaning must be replaced regardless of age.

51. A — A megger reading of 0.8 MΩ on Conductor 2 — compared to 550 MΩ on Conductor 1 — indicates that Conductor 2 has significantly compromised insulation. Healthy fire alarm circuit insulation should read in the hundreds of megohms. The 0.8 MΩ reading shows a low-resistance path to ground caused by damaged, deteriorated, or moisture-contaminated insulation on Conductor 2.

52. D — After restoring AC power, the battery charger indicator should illuminate to show that the batteries are being recharged. If the charger indicator does not activate while the panel operates normally on AC power, the charger circuit — which is separate from the AC power detection circuit — likely has a fault. The batteries will not recharge and will eventually deplete, leaving the system without secondary power.

53. B — A smoke detector covered with any material — including a clear plastic bag — is effectively disabled because smoke cannot reach the sensing chamber. Three months without detection in a stairwell — a critical evacuation route — represents a significant impairment. The bag must be removed immediately, and if construction dust contamination is a concern, the detector should be protected with manufacturer-approved covers that allow smoke entry.

54. D — NFPA 72 requires visible notification appliances to flash at a rate between 1 and 2 flashes per second. A strobe flashing once every 1.5 seconds produces approximately 0.67 flashes per second, which falls below the minimum required rate of 1 flash per second. The device must be investigated and repaired or replaced to achieve a compliant flash rate.

55. C — AC power loss every night at the same time and restoration every morning strongly indicates that a scheduled building system — such as an energy management system, a timer, or a lighting control panel — is turning off the fire alarm panel's branch circuit during off-peak hours. The fire alarm panel's dedicated circuit must be unswitched and must not be controlled by any timer, sensor, or building management system.

56. B — Most manual fire alarm stations use an internal latching mechanism that holds the device in the activated position after the handle is pulled. Resetting requires a key (commonly a hex key, allen wrench, or proprietary key) that releases the internal latch and returns the handle to the normal position. This prevents unauthorized resetting after a legitimate alarm activation.

57. A — Many air handling unit controllers are designed to require manual restart after a fire alarm shutdown as a deliberate safety feature. This prevents the AHU from automatically restarting and potentially redistributing smoke before the fire condition has been fully investigated and cleared. The manual restart requirement is a feature of the HVAC control system, not a deficiency of the fire alarm interface.

58. D — VFDs generate significant electromagnetic interference from high-frequency power switching that can affect fire alarm circuit signal integrity. However, the primary concern with the duct detector's sampling tubes is the duct width, air velocity, and manufacturer specifications — not the VFD. The EMI concern applies to the fire alarm conduit routing near the VFD, which should maintain adequate separation.

59. C — Warm air rising from the space heater creates a continuous updraft that carries dust, lint, and airborne particles from the floor and lower room levels into the detector's sensing chamber above. Over time, this accelerated particle delivery contaminates the sensing chamber faster than normal, causing the detector to drift toward its dirty threshold and generate the "Device Dirty" trouble signal.

60. B — When functionally testing an addressable smoke detector, the technician must verify that the panel displays the correct device address, the correct device type (smoke detector), and the correct programmed location descriptor (such as "Floor 3 — Room 312 — East Wing"). This point-level identification is the primary advantage of addressable systems and must be confirmed for every device.

61. A — Five consecutive device addresses failing simultaneously in the same physical location strongly suggests a single wiring fault — an open circuit or short — on the SLC that isolates the corridor section containing those devices. A single wiring problem in one location can cut off communication to all devices beyond the fault point. Inspecting the SLC wiring in the corridor is the most efficient first step.

62. D — The Record of Completion is required by NFPA 72 Section 7.8.2 for every fire alarm system installation. Its absence — regardless of how long the system has been in service or how well it has been maintained — is a documentation deficiency. Annual testing records supplement but do

not replace the Record of Completion, which certifies the system's initial compliance with the code.

63. C — A partially closed sprinkler control valve with an active tamper supervisory signal requires immediate investigation and correction. The valve must be fully opened to ensure the sprinkler system can deliver water if needed. The building owner must be notified, the valve returned to fully open, the supervisory signal verified to restore, and the condition documented in the inspection report.

64. B — A pre-recorded voice message playing at double speed — producing unintelligible audio — most likely has a fault in the message generator or digital audio playback module. The playback hardware or firmware is processing the audio file at an incorrect clock rate. The speaker and amplifier are functioning mechanically, but the source audio signal is being delivered at the wrong speed.

65. A — After reconnecting the loose battery wire and tightening the terminal, the technician must verify that the "BATTERY DISCONNECT" trouble signal clears from the panel display and that the battery charger indicator shows active charging. These two confirmations verify that the battery circuit is restored and the batteries are receiving charge, ensuring the secondary power supply is fully operational.

66. B — NFPA 72 Table 14.4.3.2 requires the fire alarm system's communication link to the supervising station to be tested annually by transmitting a test signal and confirming receipt with the monitoring station. This annual test verifies that the complete communication chain — from the panel's communicator through the transmission pathway to the station's receiving equipment — is functioning correctly.

67. A — A smoke detector that takes noticeably longer to respond than identical detectors on the same circuit suggests its sensing chamber has accumulated contamination that is reducing its sensitivity. While the detector still activates, the delayed response indicates it is approaching the lower limit of its acceptable sensitivity range. The detector should be cleaned or replaced and its sensitivity verified through testing.

68. B — Forklift traffic in a warehouse stirs up dust, cardboard fiber, and particulate matter from the floor and stored materials. These particles become airborne and can enter smoke detector sensing chambers, triggering nuisance alarms. This is one of the most common causes of false alarms in warehouse environments and may indicate that heat detectors or alternative detection technology is more appropriate for the space.

69. C — The smoke detector activated correctly, the panel processed the alarm and commanded the door release, but the door did not physically release. The fault lies in the control chain from the panel to the door — the control module's output, the wiring between the module and the magnetic holder, or the magnetic holder device itself. Each component in this chain must be inspected to identify the failure point.

70. B — While the trouble could indicate the loop approaching its current capacity limit after adding three devices, a more likely cause is that one of the three new devices has an internal fault drawing excessive current from the SLC. The technician should check each new device individually — removing them one at a time to identify which device is causing the overcurrent condition before investigating overall loop capacity.

71. D — NFPA 72 Table 14.3.1 requires semiannual visual inspection of sealed lead-acid batteries. The visual inspection checks for physical signs of degradation including case swelling, bulging, electrolyte leakage, terminal corrosion, and loose connections. These physical indicators can reveal battery problems that voltage measurements alone may not detect.

72. B — NFPA 72 requires waterflow alarm signals to be received within 90 seconds of sustained flow. If 90 seconds have elapsed with no alarm signal at the panel, the waterflow switch has failed its functional test. The switch mechanism, its wiring, or its connection to the fire alarm panel must be investigated. The retard delay setting should also be checked as it may be contributing to excessive total response time.

73. A — NFPA 72 Table 14.4.3.2 requires sensitivity testing within one year of installation and every alternate year thereafter. With the initial test completed at year one, the next test is due at year three — two years after the first test, following the alternate-year schedule. This cycle continues: year 1, year 3, year 5, year 7, and so on.

74. D — The warm exhaust from the ceiling-mounted projector creates a thermal barrier of heated air between the ceiling and the room below. This warm air layer can deflect rising smoke away from the detector, preventing it from entering the sensing chamber. The thermal plume effectively shields the detector from smoke that would otherwise reach it through natural convection.

75. D — Both programming error and wiring error are valid explanations. The tamper switch may be correctly wired but programmed as an alarm point instead of supervisory (programming error), or it may be correctly programmed but physically wired to an alarm zone input instead of a supervisory zone input (wiring error). Both possibilities must be investigated to determine which caused the incorrect signal type.

76. B — Twenty-three brief, intermittent supervisory signals from a tamper switch monitor module over one month — each lasting only minutes — suggests the valve is experiencing minor vibration or movement that intermittently triggers the switch. Sources include building vibration, water pressure fluctuations in the sprinkler piping, or a valve that is not fully secured in the open position. The valve and switch adjustment should be inspected.

77. C — A reading of 25.8 VDC with the charger connected is below the typical float charge range of 27.0–27.6 VDC for a 24V SLA battery system, but may be acceptable under certain conditions — such as when the system is under heavy standby load, the batteries are recovering from a recent discharge, or the panel design uses a lower float voltage setpoint. The technician should investigate further but the reading alone does not definitively indicate charger failure.

78. D — A dim LCD display is a deficiency because building operators, maintenance personnel, and emergency responders must be able to clearly read the panel display to identify alarm locations, trouble conditions, and system status during both normal operations and emergencies. A display that is difficult to read can delay response to alarms and impair troubleshooting. The display must be repaired or replaced.

79. A — The missing smoke detector is a critical deficiency that must be documented and corrected immediately. Removing a fire alarm detector — regardless of the reason — leaves that area without fire detection coverage. The manager's action, while understandable from a nuisance alarm perspective, creates a life safety gap. The solution is to install appropriate detection technology for the kitchen environment — such as a heat detector or multi-criteria detector.

80. B — A 45-second signal transmission and receipt time is within the acceptable range for most fire alarm communication technologies. DACT communication typically takes 30–90 seconds for the dialing, handshake, and data transmission sequence. IP and cellular communicators are generally faster. The specific acceptable time depends on the communication technology and NFPA 72 requirements for the supervising station type.

81. D — Whether duct smoke detectors trigger general building notification is determined by the system's sequence of operations — not by a universal code rule. Some systems program duct detectors to shut down the HVAC only, while others include general alarm notification. The technician should review the approved sequence of operations to verify whether the observed response matches the designed and approved system behavior.

82. C — NFPA 72 Table 14.4.3.2 requires emergency control functions — including elevator recall, HVAC shutdown, and door release — to be functionally tested annually. Two years without testing means two consecutive annual test cycles have been missed. These functions must be tested immediately and the overdue testing documented as a deficiency in the inspection records.

83. A — At 15.2 VDC, the voltage at the farthest device on NAC 2 falls below the minimum listed operating voltage of 16 VDC. Devices operating below their listed range may fail to produce rated output or may not operate at all. The circuit must be redesigned using larger conductors, shorter runs, fewer devices, or a booster power supply to bring the end-of-circuit voltage above 16 VDC.

84. C — Programming an addressable fire alarm panel requires the complete device information: the address number (089), device type (smoke detector), location descriptor (Floor 3, Room 312), SLC assignment (SLC 1), and zone assignment (Zone 3). All of these data points are needed to properly configure the panel so that when the device activates, the panel displays accurate identification and triggers the correct programmed responses.

85. B — The as-built drawings show 145 devices on SLC 1, but 10 new devices were added during renovation, bringing the actual installed count to 155. The as-built drawings must be updated to reflect this current installed configuration. Accurate as-built documentation is a code requirement

that supports future maintenance, troubleshooting, and system modifications throughout the life of the fire alarm system.