PRACTICE EXAM 13: CTS-D SIMULATION (110 QUESTIONS)

Time Limit: 180 minutes | Passing Score: 70%

1. A specification calls for a 55-inch display at 30 ft farthest viewing for Basic Decision Making. The design error is:

A. Display is too large for the room

B. Display fails DISCAS BDM — 30 ft requires 60-inch image height minimum

C. Display exceeds budget parameters

D. Display color space is wrong

2. A designer specifies Cat5e for a 90-meter HDBaseT run at 4K@60 Hz. The specification error is:

A. Distance exceeds maximum

B. Cat5e is inadequate for the resolution

C. HDBaseT doesn't support 4K

D. Cat6A is required and distance exceeds 70 m for 4K@60 Hz 4:4:4

3. A specification lists 6 ceiling speakers in a 2,400 sq ft room for Standard ACU. The design issue is:

A. Insufficient speaker count — approximately 24 speakers needed for Standard ACU at typical ceiling height

B. Too many speakers

C. Wrong speaker type

D. Spacing is adequate

4. A designer specifies a 15 A circuit for an AV rack drawing 14 A continuous. The NEC error is:

A. Circuit is adequate

B. Circuit is slightly undersized

C. NEC 80% derating limits continuous to 12 A on 15 A circuit

D. Requires 30 A circuit

5. A specification omits IGMP snooping requirements for an AV-over-IP system with 12 encoders. The missing element causes:

A. Multicast flooding consuming bandwidth on every switch port

B. Display resolution reduction

C. Audio quality degradation

D. Control system failure

6. A designer specifies HDMI 2.0 for 4K@60 Hz 4:4:4 12-bit content. The specification gap is:

A. HDMI 2.0 is adequate

B. Resolution is too high

C. Cable length is the issue

D. 18 Gbps HDMI 2.0 bandwidth is insufficient for 12-bit 4:4:4

7. A specification calls for STC 30 between a boardroom and adjacent corridor. The privacy concern is:

A. STC 30 exceeds requirements

B. STC 30 permits audible speech — STC 40+ needed for privacy

C. STC is irrelevant

D. STC 30 is adequate for boardrooms

8. A designer specifies 10 dB headroom for a live music venue. The specification error is:

A. Headroom is excessive

B. 10 dB is standard

C. Music requires 15-20 dB headroom — 10 dB is speech-only specification

D. No headroom is needed

9. A specification for a conference room lists PoE (802.3af) for a PTZ camera requiring 40 W. The power gap is:

A. PoE delivers 12.95 W — camera requires PoE++ (802.3bt) for 40 W

B. PoE is adequate

C. Camera doesn't need power

D. PoE+ is sufficient

10. A designer routes audio cable parallel to 208 V power in the same conduit for 50 feet. The code violation is:

A. Distance is too short to matter

B. Shielded cable permits this

C. Only affects digital signals

D. Signal and power must be separated per NEC and best practice

11. A specification calls for consumer-grade displays in a 24/7 digital signage deployment. The specification error is:

A. Consumer displays are adequate

B. Resolution is the issue

C. Consumer displays lack thermal management for continuous duty

D. Consumer displays are too expensive

12. A designer specifies HDCP 2.0 for a 4K UHD content distribution system. The specification gap is:

A. HDCP 2.0 exceeds requirements

B. HDCP 2.2 minimum is required for protected 4K UHD content

C. HDCP is not needed

D. HDCP 2.3 is the only option

13. A specification omits cable labeling requirements. The omission impacts:

A. Future serviceability — RP-38-17 labeling is industry standard for professional AV

B. System performance

C. Equipment warranty

D. Audio quality

14. A designer specifies a single 20 A circuit for 6 rack-mounted amplifiers totaling 2,200 W continuous. The NEC issue is:

A. Circuit is adequate

B. Amperage is within limits

C. Only intermittent loads

D. 2,200 W exceeds 1,920 W continuous limit on 20 A/120 V circuit

15. A specification calls for RT60 of 2.0 seconds in a conference room. The acoustic error is:

A. RT60 is too low

B. RT60 is adequate

C. RT60 is excessive — conference rooms target 0.4-0.6 seconds

D. RT60 is irrelevant

16. A designer specifies a projector with 1.2:1 throw ratio for a 30-foot throw distance onto a 120-inch screen (width 104.6 inches). The resulting image width is:

A. 300 inches — projector overfills the screen dramatically

B. 104.6 inches — correct match

C. 80 inches — image too small

D. 150 inches — moderate overfill

17. A specification lists NTP synchronization for an SMPTE ST 2110 broadcast facility. The specification error is:

A. NTP is adequate for broadcast

B. NTP and PTP are equivalent

C. GPS is required

D. ST 2110 requires sub-microsecond PTP — NTP is insufficient

18. A designer specifies 4 mm pixel pitch for a video wall with 3-meter closest viewing distance. The visual concern is:

A. Pixel pitch is too fine

B. Viewers at 3 m see individual pixels — 4 mm requires 12 m minimum

C. Pixel pitch is adequate

D. Content resolves the issue

19. A specification calls for a single VLAN for all AV-over-IP traffic including control, video, and management. The network concern is:

A. Single VLAN is adequate

B. Only two VLANs needed

C. Separate VLANs needed for AV video, AV control, and AV management traffic

D. VLAN is irrelevant for AV

20. A designer specifies 3:1 safety factor for overhead rigging in a performing arts center over occupied seating. The safety concern is:

A. 10:1 safety factor required for overhead loads above occupied space

B. 3:1 is adequate

C. 5:1 is the standard

D. Safety factor is irrelevant

21. A specification omits firestop requirements for AV conduit penetrations through 2-hour fire-rated walls. The code violation is:

A. Firestop is optional

B. Only applies to data cables

C. General contractor handles this

D. UL-listed firestop assemblies required for all rated penetrations

22. A designer specifies TLS 1.0 for AV device network security. The security gap is:

A. TLS 1.0 is current

B. TLS 1.0 is deprecated — minimum TLS 1.2 required

C. TLS is not applicable to AV

D. Any TLS version is acceptable

23. A specification for a courtroom recording system stores recordings on a single local hard drive. The reliability concern is:

A. Local storage is adequate

B. Consumer-grade backup is sufficient

C. Cloud-only storage is better

D. Tamper-evident redundant storage with archival retention required

24. A designer specifies standard office lighting (3500 K, CRI 80) for a video conferencing room. The video quality concern is:

A. Lighting is adequate

B. CRI 90+ and 4000-5000 K tunable white needed for camera performance

C. Only brightness matters

D. Color temperature is irrelevant

25. A specification calls for a single amplifier driving 30 ceiling speakers in a 70V system at 3 W each (90 W load) with no headroom. The reliability concern is:

A. Amplifier operating at 100% capacity — 25-33% headroom needed for reliability

B. Load is too light

C. Speaker count is excessive

D. 70V is wrong for this application

26. A designer specifies analog audio distribution over 500-foot cable runs. The signal quality concern is:

A. Analog is ideal for long runs

B. Cable gauge is the only issue

C. Analog signal degradation over distance — networked audio (Dante/AES67) preferred

D. No concern at this distance

27. A specification omits AEC requirements for a video conferencing room with in-room loudspeakers. The user experience impact is:

A. AEC is optional

B. No impact expected

C. Minor convenience issue

D. Remote participants hear echo of their own voice without AEC

28. A designer specifies a 20 A circuit for a video wall drawing 18.5 A intermittently. The NEC assessment is:

A. Exceeds circuit capacity

B. Intermittent load within 20 A rating — acceptable if truly non-continuous

C. Requires 30 A circuit

D. Requires 208 V circuit

29. A specification calls for loudspeaker delay fills at 10 meters but omits delay timing. The coverage impact is:

A. Delay fills without timing produce Haas-violating conditions and intelligibility degradation

B. Delay timing is automatic

C. No timing needed at 10 m

D. Amplifier handles timing

30. A designer specifies identical AV systems in both an executive boardroom and a storage closet converted to a huddle room. The design issue is:

A. Identical systems save money

B. Standardization is always correct

C. Room type and use case require different specifications — one-size-fits-all wastes resources

D. Both rooms need premium equipment

31. A specification calls for HDMI passive cable at 25 feet for 4K@60 Hz 4:4:4 distribution. The signal integrity concern is:

A. 25 ft is within passive range

B. Cable quality is the only factor

C. Resolution doesn't affect distance

D. Passive HDMI typically fails beyond 15 ft at 4K@60 — active cable required

32. A designer specifies ceiling speakers at 15-foot spacing with 10-foot ceiling and 90° pattern. The coverage issue is:

A. Spacing is ideal

B. 15 ft exceeds coverage diameter of 12 ft — gaps between speakers violate ACU

C. Spacing is too close

D. Pattern is wrong

33. A specification omits seismic bracing for ceiling-mounted displays in a California facility. The code violation is:

A. California seismic codes require bracing for overhead-mounted equipment in occupied spaces

B. Seismic bracing is optional

C. Only applies to racks

D. Manufacturer mounting is sufficient

34. A designer specifies a 48 kHz DSP for a recording studio requiring 96 kHz operation. The specification error is:

A. 48 kHz is adequate

B. Sample rate doesn't matter

C. DSP sample rate fails the 96 kHz specification requirement

D. 48 kHz exceeds needs

35. A specification calls for assistive listening capacity for 10% of seats in a 500-seat auditorium. ADA requires:

A. 10% is adequate

B. 5% is sufficient

C. 2% is the minimum

D. ADA requires scaled quantities — 500 seats requires minimum 20 receivers plus 2 neckloops

36. A designer specifies a 4K projector at maximum throw distance but does not verify lens shift range. The installation risk is:

A. Projector may require physical repositioning if lens shift cannot achieve required image offset

B. Lens shift is always adequate

C. Only throw ratio matters

D. Installer adjusts on-site

37. A specification omits QoS configuration for an AV-over-IP network sharing infrastructure with enterprise data. The performance risk is:

A. QoS is optional

B. AV traffic competes with data traffic causing video artifacts and audio dropouts

C. Enterprise network handles priority

D. Bandwidth is sufficient without QoS

38. A designer specifies a conduit with 50% cable fill for 6 Cat6A cables. The NEC concern is:

A. 50% fill is acceptable

B. Fill is too low

C. Only applies to power cables

D. NEC limits three-or-more conductors to 40% fill

39. A specification calls for a touch panel with 3-second average response time. The user experience concern is:

A. 3 seconds is acceptable

B. Response time is irrelevant

C. Under 500 ms target required — 3 seconds causes user frustration

D. 3 seconds is fast

40. A designer specifies a matrix switcher with HDCP 2.2 on inputs but HDCP 1.4 on outputs. The content delivery issue is:

A. HDCP chain fails — every output must support HDCP 2.2 for protected 4K content

B. Input compliance is sufficient

C. Outputs don't need HDCP

D. HDCP 1.4 is backward compatible

41. A specification omits power sequencing for a rack with 8 amplifiers on one circuit. The electrical risk is:

A. Sequencing is optional

B. Simultaneous power-on inrush current may trip the circuit breaker

C. Amplifiers self-sequence

D. Circuit sizing prevents issues

42. A designer specifies standard drywall mounting for a 200-pound video wall without structural backing. The structural risk is:

A. Drywall is adequate

B. Standard mounting hardware is sufficient

C. Weight is within drywall limits

D. Structural backing and engineering required — drywall cannot support 200 pounds

43. A specification calls for Cat6A at 120 meters for HDBaseT 1080p distribution. The distance issue is:

A. 100 meters is HDBaseT maximum — 120 m exceeds specification

B. Cat6A handles 120 m

C. 1080p permits longer runs

D. Distance is irrelevant for HDBaseT

44. A designer specifies outdoor speakers without IP rating for a pool area installation. The equipment concern is:

A. Indoor speakers are adequate outdoors

B. IP rating is optional

C. Weather-rated speakers with appropriate IP rating required for outdoor/wet environments

D. Pool area is covered

45. A specification omits warranty duration requirements, referencing only manufacturer standard warranty. The contractual gap is:

A. Specification should define required parts and labor warranty duration independent of manufacturer

B. Manufacturer warranty is sufficient

C. Warranty is integrator's decision

D. No warranty needed

46. A designer specifies 70V distribution for a critical listening studio environment. The audio quality concern is:

A. 70V is ideal for studios

B. 70V is adequate

C. 70V transformer insertion loss and frequency response limit quality — low-impedance direct drive preferred

D. No difference between systems

47. A specification calls for a projector without specifying ambient light control in a room with floor-to-ceiling west-facing windows. The image quality risk is:

A. Projector brightness compensates

B. Windows are irrelevant

C. Screen selection resolves this

D. Afternoon sunlight destroys ISCR — ambient light control specification required

48. A designer specifies PoE+ for 20 cameras but the network switch has only 370 W PoE budget. At 25.5 W per device, total load is 510 W. The power gap is:

A. Switch budget is adequate

B. Switch PoE budget insufficient — 510 W exceeds 370 W capacity by 140 W

C. Cameras don't use full PoE+ allocation

D. External power supplies resolve this

49. A specification omits emergency audio override integration with the fire alarm system. The life safety gap is:

A. Fire alarm mutes AV automatically during emergency notification per code requirements

B. Fire alarm is separate from AV

C. No integration needed

D. General contractor handles this

50. A designer specifies a single-point-of-failure control processor with no backup for a mission-critical broadcast facility. The reliability concern is:

A. Single processor is standard

B. Backup processors are unnecessary

C. Mission-critical systems require redundant control with automatic failover

D. Manual backup is adequate

51. A specification calls for 16 AWG speaker cable on a 200-foot run to an 8-ohm loudspeaker. Cable resistance is approximately 1.6 ohms. The loss concern is:

A. Cable gauge is adequate

B. Loss is minimal

C. Only affects high frequencies

D. 1.6 ohms on 8-ohm load = 20% loss — heavier gauge required

52. A designer specifies DHCP for all AV devices on a production network. The management concern is:

A. DHCP is industry standard

B. Static IP or DHCP reservation needed — DHCP reassignment can break AV device communication

C. IP addressing doesn't matter

D. Network team handles this

53. A specification for a 200-seat lecture hall omits assistive listening. The compliance gap is:

A. ADA requires assistive listening systems in assembly spaces with fixed seating

B. Assistive listening is optional

C. Only for theaters

D. Students bring personal devices

54. A designer specifies consumer-grade HDMI cables for a permanent installation behind walls. The serviceability concern is:

A. Consumer cables are adequate

B. Cable quality doesn't matter

C. In-wall cables don't need specification

D. Plenum-rated CL2/CL3 or CMP cables required per NEC for in-wall/plenum installation

55. A specification omits cooling requirements for a sealed AV rack in a small closet. The thermal risk is:

A. Sealed racks self-ventilate

B. Small closets stay cool

C. Equipment overheats without specified ventilation — thermal management required

D. Rack fans are sufficient alone

56. A designer specifies an 85-inch display at 8 ft viewing for Passive Viewing. Display image height is approximately 42 inches. DISCAS Passive divisor is 8. Required height is 12 inches. The assessment is:

A. Display significantly exceeds Passive requirement — verify if ADM or BDM is the actual need

B. Display is too small

C. Display matches requirement exactly

D. Viewing distance is too far

57. A specification calls for a video conference codec with 500 ms end-to-end latency. The user experience concern is:

A. 500 ms is acceptable

B. 500 ms exceeds 150 ms target — conversational delay will disrupt natural interaction

C. Latency doesn't affect video calls

D. Audio compensates

58. A designer specifies fiber optic cable at bend radius of 3x cable diameter through a tight conduit pathway. The installation concern is:

A. 3x is adequate

B. Bend radius is irrelevant for fiber

C. Only copper has bend limits

D. Fiber requires minimum 10x cable diameter — 3x causes micro-bending loss or breakage

59. A specification omits display color calibration requirements for a multi-display corporate environment. The visual quality concern is:

A. Calibration is unnecessary

B. Manufacturer default is adequate

C. Displays appear inconsistent without specified calibration targets and Delta E tolerance

D. Only broadcast needs calibration

60. A designer specifies a wireless microphone system without conducting RF frequency coordination in a dense urban venue. The performance risk is:

A. RF coordination identifies interference sources and available frequencies — omission risks dropouts

B. Modern wireless auto-coordinates

C. Venue frequency is always clear

D. RF issues are rare

61. A specification calls for 12 AWG wire on a 30 A, 208 V circuit. NEC minimum for 30 A is 10 AWG. The code violation is:

A. 12 AWG is adequate for 30 A

B. 12 AWG is undersized — NEC requires 10 AWG minimum for 30 A circuits

C. Wire gauge doesn't affect safety

D. 14 AWG is acceptable

62. A designer specifies AV equipment on the corporate network without consulting the IT department. The integration risk is:

A. AV devices operate independently

B. IT coordination is optional

C. Network is shared — no conflict

D. IT policy may prohibit devices or require specific VLAN/QoS/security configuration

63. A specification omits signal flow diagrams from the construction document set. The construction impact is:

A. Signal flow diagrams communicate system architecture — omission creates installation ambiguity

B. Signal flow is integrator's responsibility

C. Only needed for broadcast

D. Schematics are adequate alone

64. A designer specifies 3,000 K lighting for a video conference room. The camera performance concern is:

A. 3,000 K is ideal

B. Warm light is flattering on camera

C. 3,000 K produces warm orange cast on camera — 4,000-5,000 K preferred

D. Color temperature doesn't affect video

65. A specification calls for open-back racks in a room accessible to non-technical staff. The safety concern is:

A. Open-back racks are standard

B. Non-technical access risks damage — enclosed racks with locked doors required

C. Rack type doesn't matter

D. Staff won't touch equipment

66. A designer specifies a 2×2 video wall for a room requiring 60 ft viewing distance at BDM. Each panel is 55 inches (image height per panel ~27 inches, total wall height ~54 inches). Required BDM height at 60 ft is 120 inches. The design gap is:

A. Video wall meets requirement

B. Video wall is too large

C. Content compensates

D. 54-inch wall height fails 120-inch BDM requirement — larger configuration needed

67. A specification omits network segmentation between AV devices and building automation systems. The cybersecurity concern is:

A. Segmentation is optional

B. Building automation is low risk

C. Unsegmented networks create cross-system attack vectors

D. Firewall alone is sufficient

68. A designer specifies a ceiling-mounted PTZ camera at 15 ft height in a 20-seat conference room. The framing concern is:

A. 15 ft height creates steep downward angle producing unflattering framing of seated participants

B. Height is ideal for coverage

C. PTZ compensates for height

D. Camera height doesn't affect framing

69. A specification calls for a single 20 A circuit powering both AV equipment and a kitchenette microwave. The design concern is:

A. Shared circuits are standard

B. Microwave is low-draw

C. AV handles power fluctuation

D. AV and appliance loads must be on separate circuits to prevent interference

70. A designer specifies 4K resolution for a lobby digital signage system viewed at 25 ft with 55-inch displays. The resolution assessment is:

A. 4K is essential at this distance

B. 4K benefit is imperceptible at 25 ft on 55-inch — 1080p sufficient and cost-effective

C. 8K is needed

D. Resolution doesn't matter

71. A specification omits control system source code transfer to the owner at closeout. The operational risk is:

A. Owner receives source code to enable future modifications without integrator dependency

B. Source code is integrator property

C. Programming is not transferable

D. Owner doesn't need source code

72. A designer specifies background music at 80 dBA in a restaurant dining room. The comfort concern is:

A. 80 dBA is comfortable

B. 80 dBA matches typical requirement

C. 80 dBA is excessive for dining — typical background music level is 55-65 dBA

D. Volume is adjustable

73. A specification calls for a 70V paging system in a hospital but omits integration with the nurse call system. The clinical workflow gap is:

A. Paging is standalone

B. Nurse call is separate from AV

C. IT handles integration

D. Nurse call integration required for coordinated patient care communication

74. A designer specifies a standard power strip for mission-critical broadcast equipment. The reliability concern is:

A. Power strip is adequate

B. Mission-critical equipment requires UPS with surge protection, not consumer power strips

C. Any power source works

D. Generator backup is sufficient alone

75. A specification omits acoustic treatment in a room with parallel hard walls and 12-foot ceiling. The acoustic risk is:

A. Flutter echo between parallel surfaces degrades speech intelligibility

B. Parallel walls are not a concern

C. Ceiling height compensates

D. Equipment resolves reflections

76. A designer specifies 100 Mbps network switches for an AV-over-IP system with 4K encoders. The bandwidth concern is:

A. 100 Mbps is adequate

B. Only affects non-AV traffic

C. 4K streams require Gigabit or higher — 100 Mbps cannot carry a single 4K stream

D. Compression solves the problem

77. A specification calls for a projector in a room with NC-25 ambient noise, but the projector has a 45 dBA fan noise rating. The acoustic concern is:

A. Projector noise is inaudible

B. Fan noise is irrelevant

C. NC-25 compensates

D. 45 dBA projector exceeds room ambient — fan noise audibly intrusive at NC-25

78. A designer specifies a touch panel with 12-point font for a senior living community common area. The accessibility concern is:

A. 12-point is standard

B. Senior users need larger fonts (14+ points minimum) and simplified high-contrast interface

C. Font doesn't matter for touch

D. Seniors use the same interface

79. A specification omits smoke detection requirements in an AV equipment closet. The fire safety concern is:

A. Smoke detection required per code for equipment rooms with concentrated electrical loads

B. AV rooms don't need detection

C. Building fire alarm covers this

D. Sprinklers are sufficient

80. A designer specifies an 8-channel DSP for a project requiring 12 input channels. The specification error is:

A. 8 channels is sufficient

B. DSP can be expanded

C. DSP input count insufficient — 12-channel or larger unit required

D. Mix-minus resolves the gap

81. A specification calls for open-mesh cable trays without any pathway separation between audio and data cables. The signal integrity concern is:

A. Open mesh provides ventilation

B. Separation is unnecessary

C. Cable tray permits co-mingling

D. Signal class separation required — audio, video, and data should be physically separated

82. A designer specifies identical speaker models for both a conference room and a gymnasium. The application concern is:

A. Standardization saves cost

B. Conference room speakers lack SPL capability and coverage for gymnasium applications

C. Gymnasium needs fewer speakers

D. Speakers are universal

83. A specification omits IT coordination requirements for an enterprise AV deployment of 40 conference rooms. The network risk is:

A. IT coordination documents VLAN, QoS, IP addressing, and security requirements across all rooms

B. AV operates independently

C. IT automatically accommodates AV

D. Integrator handles all networking

84. A designer specifies a 200 W amplifier for a speaker rated at 75 W continuous. The equipment risk is:

A. Amplifier matches speaker

B. 200 W is conservative headroom

C. Amplifier must not exceed 2x speaker continuous rating — 200 W risks speaker damage

D. Speaker handles any amplifier

85. A specification calls for a single Cat6A cable for a room requiring video, audio, control, and network connectivity. The infrastructure concern is:

A. One cable handles all signals

B. Cat6A supports converged traffic

C. Wireless supplements the cable

D. Multiple cables required — single cable creates single point of failure and bandwidth limitation

86. A designer specifies a projector at 3,000 lumens for a room with 500 lux ambient light on a 120-inch screen. The image quality concern is:

A. 3,000 lumens is adequate

B. 3,000 lumens insufficient for high ambient — 5,000+ lumens or ambient light control needed

C. Screen gain compensates

D. Ambient light is irrelevant

87. A specification omits as-built drawing requirements at project closeout. The operational impact is:

A. As-builts document actual installed condition for future service and modification

B. Construction drawings are sufficient

C. Integrator provides as-builts automatically

D. As-builts are optional

88. A designer specifies consumer Wi-Fi for a wireless presentation system in a 50-person conference room. The performance concern is:

A. Consumer Wi-Fi is adequate

B. Wi-Fi handles 50 users

C. Enterprise-grade wireless with dedicated SSID needed for reliable presentation in dense environments

D. Consumer equipment saves cost

89. A specification calls for a control system but omits operational scenario documentation. The programming risk is:

A. Scenarios are integrator's choice

B. Without scenarios the programmer interprets user needs — resulting in user experience mismatch

C. Scenarios are obvious

D. Control is plug-and-play

90. A designer specifies a 10 Gbps network switch but connects all AV devices via 1 Gbps copper ports. The bottleneck concern is:

A. 1 Gbps ports are adequate for individual device connections

B. 10 Gbps switch is wasted

C. All ports should be 10 Gbps

D. 10 Gbps uplink with 1 Gbps access ports prevents port-to-uplink congestion

91. A specification omits grounding requirements for AV racks in a broadcast facility. The audio quality risk is:

A. Single-point ground required — omission causes ground loops producing audible hum

B. Grounding is automatic

C. Only RF equipment needs ground

D. Building ground is sufficient

92. A designer specifies a 3×3 LED video wall with 10 mm pixel pitch for a corporate lobby with 8-foot closest viewing. The visual quality concern is:

A. 10 mm is premium quality

B. Pixel pitch is irrelevant for LED

C. 10 mm requires 30 m minimum — at 8 ft viewers see obvious pixel grid

D. Content quality compensates

93. A specification for a healthcare telehealth studio omits HIPAA compliance requirements. The regulatory risk is:

A. HIPAA is IT-only concern

B. Telehealth uses consumer platforms

C. General security is sufficient

D. HIPAA compliance mandatory — encrypted transport, access controls, and audit logging required

94. A designer specifies amplifier rack placement 300 feet from loudspeakers using low-impedance cabling. The signal quality concern is:

A. Distance is irrelevant

B. 300 ft low-impedance cable run produces significant resistive loss — amplifiers should be near speakers

C. Cable gauge compensates

D. Digital audio eliminates loss

95. A specification omits conduit sizing calculations for a pathway carrying 15 Cat6A cables. The installation risk is:

A. Undersized conduit causes installation damage and exceeds NEC fill requirements

B. Conduit sizing is installer's decision

C. 15 cables fit any conduit

D. Pathway size doesn't matter

96. A designer specifies identical audio DSP configurations for a lecture hall and a gymnasium without adjusting for different room acoustics. The audio quality concern is:

A. DSP configurations are universal

B. Identical configurations save time

C. Different room volumes and RT60 require different EQ, delay, and processing parameters

D. Acoustics don't affect DSP settings

97. A specification calls for a projector replacement lamp in stock but omits the lamp's shelf life. The maintenance risk is:

A. Lamps last forever

B. Lamp chemistry is irrelevant

C. Replacement resolves any issue

D. Projector lamps degrade in storage — shelf life specification ensures usable spare stock

98. A designer specifies a video conferencing system without verifying network bandwidth availability with IT. The performance risk is:

A. Bandwidth verification prevents video quality degradation during peak network utilization

B. Video conferencing uses minimal bandwidth

C. IT automatically provides bandwidth

D. Codec adapts to any bandwidth

99. A specification omits training requirements for a complex AV system deployment. The operational risk is:

A. Training is optional

B. Users cannot effectively operate the system — training specification ensures adoption

C. Systems are self-explanatory

D. Manufacturer provides training

100. A designer specifies a microphone at 10 feet from the presenter in a room with RT60 of 1.5 seconds. The intelligibility concern is:

A. 10-foot pickup distance is standard

B. RT60 doesn't affect microphones

C. Critical distance exceeded — microphone captures reverberant energy reducing intelligibility

D. Closer microphone changes nothing

101. A specification calls for video distribution via analog VGA in a new construction project. The specification concern is:

A. VGA is standard for new builds

B. VGA supports adequate resolution

C. Cable cost favors VGA

D. VGA is obsolete — digital HDMI, HDBaseT, or AV-over-IP required for current standards

102. A designer specifies a PoE-powered touch panel on a switch port 100 meters away. The power concern is:

A. PoE voltage drop at 100 m reduces available power — verify device operates within derated power budget

B. PoE handles any distance

C. 100 m is within specification

D. Touch panels use minimal power

103. A specification omits surge protection for AV equipment connected to building power. The equipment risk is:

A. Building protection is adequate

B. Surge protection prevents voltage transients from damaging sensitive AV equipment

C. AV equipment has internal protection

D. Surges are rare

104. A designer specifies a 4K camera for IMAG in a 500-seat performance venue with screens at 150 ft. The resolution assessment is:

A. 4K is unnecessary for IMAG

B. 1080p is adequate for IMAG at this distance

C. 4K provides detail benefit for large-format IMAG displays at extended viewing distances

D. Resolution doesn't matter for IMAG

105. A specification for a worship space omits STI verification requirements. The commissioning gap is:

A. STI verification confirms speech intelligibility meets the 0.70+ specification target

B. STI is not measurable

C. Subjective listening test is sufficient

D. STI only applies to PA systems

106. A designer specifies background music throughout a hospital including patient rooms at night. The patient care concern is:

A. Background music aids recovery

B. Music is therapeutic

C. Patients appreciate background audio

D. Nighttime audio disrupts patient rest — zoned control and scheduling required per clinical protocol

107. A specification calls for a 4:3 aspect ratio screen in a room used exclusively for widescreen presentations and video conferencing. The format concern is:

A. 4:3 is versatile

B. 16:9 required — 4:3 wastes screen area with letterboxed widescreen content

C. Aspect ratio is adjustable

D. Content fills any screen

108. A designer specifies a wireless presentation gateway supporting only Apple AirPlay in a mixed-platform corporate environment. The compatibility concern is:

A. Multi-platform support (AirPlay, Miracast, Chromecast) required for BYOD environments

B. AirPlay covers most devices

C. Windows users can adapt

D. Platform doesn't matter

109. A specification omits UPS battery replacement schedule for a mission-critical AV system. The reliability concern is:

A. Batteries last indefinitely

B. UPS self-maintains

C. Battery replacement schedule prevents unannounced UPS failure from degraded batteries

D. Generator eliminates UPS need

110. A designer specifies a room combining a noisy MDF/server room with AV equipment racks. The acoustic concern is:

A. Shared rooms save space

B. Server noise is minimal

C. Equipment racks are quiet

D. Server fan noise contaminates AV audio — separate rooms or acoustic isolation required

PRACTICE EXAM 13: ANSWER KEY AND EXPLANATIONS

1. B — Display fails DISCAS BDM at 30 ft viewing distance. BDM formula: 30 ft × 12 = 360 inches ÷ 6 = 60 inches minimum image height. A 55-inch diagonal 16:9 display produces approximately 27 inches of image height, dramatically failing the 60-inch requirement. This is a common design error when display diagonal is confused with image height.

2. D — Cat6A is required and 70 m maximum applies at 4K@60 Hz 4:4:4. HDBaseT requires Cat6A cable for reliable high-bandwidth transmission; Cat5e lacks the frequency performance needed for 4K signals. Additionally, 4K@60 Hz 4:4:4 reduces the reliable distance from 100 m (at 1080p) to approximately 70 m, making the 90 m run doubly problematic.

3. A — Insufficient speaker count for Standard ACU coverage. At a typical 10 ft ceiling with 90° pattern speakers, each speaker covers approximately 100–115 sq ft at Standard ACU (±3 dB). A 2,400 sq ft room requires approximately 21–24 speakers, not 6. Six speakers would create massive coverage gaps with SPL variation far exceeding ±3 dB.

4. C — NEC 80% continuous derating limits a 15 A circuit to 12 A continuous. The 14 A continuous load exceeds this 12 A limit by 2 A, creating a code violation. Minimum 20 A circuit required: 14 A ÷ 0.80 = 17.5 A, rounded up to 20 A standard breaker size.

5. A — Multicast flooding consumes bandwidth on every switch port without IGMP snooping. AV-over-IP encoders generate multicast traffic that, without IGMP snooping, is treated as broadcast and floods every port on the switch. This consumes bandwidth network-wide and can saturate links serving non-AV devices.

6. D — 18 Gbps HDMI 2.0 bandwidth insufficient for 4K@60 Hz 4:4:4 12-bit. The raw bandwidth for this signal exceeds 17.9 Gbps, leaving virtually no headroom on HDMI 2.0. HDMI 2.1 (48 Gbps) is required for reliable 12-bit 4:4:4 transport with adequate margin.

7. B — STC 30 permits audible speech transmission between rooms. Normal conversational speech can be understood through STC 30 partitions, making confidential boardroom discussions audible in adjacent spaces. STC 40+ is the minimum standard for speech privacy in professional meeting environments.

8. C — Music reinforcement requires 15–20 dB headroom rather than 10 dB. Music has significantly wider dynamic range than speech, producing transient peaks that require additional amplifier headroom to reproduce without clipping. Specifying speech-level headroom for a music venue guarantees audible distortion during peak musical passages.

9. A — PoE (802.3af) delivers only 12.95 W at the device, far below the camera's 40 W requirement. PoE+ (802.3at) delivers 25.5 W, which is still insufficient. The camera requires PoE++ (802.3bt) Type 3 (51 W) or Type 4 (71 W) to operate at its full 40 W draw.

10. D — Signal and power cables must be separated per NEC and industry practice. Parallel routing of audio cables alongside 208 V power in the same conduit creates electromagnetic interference that couples into audio signals. NEC requires separation, and professional practice specifies minimum 6-inch clearance or physical barrier between signal and power classes.

11. C — Consumer displays lack thermal management engineered for continuous 24/7 duty. Consumer panels are designed for intermittent household use and typically fail within 6–12 months under continuous operation due to overheating, backlight degradation, and power supply stress. Commercial-grade continuous-duty displays are specifically engineered for 24/7 operation.

12. B — HDCP 2.2 is the minimum version required for protected 4K UHD content delivery. HDCP 2.0 predates the 4K content protection requirement and will not pass protected 4K content through the distribution chain. Every device from source to display must support HDCP 2.2 for compliant 4K content delivery.

13. A — Future serviceability depends on cable labeling per RP-38-17. Without standardized labels, troubleshooting and modification of the AV system becomes extremely time-consuming and error-prone. Service technicians cannot identify cable paths, signal types, or source/destination relationships without proper labeling at both cable ends.

14. D — 2,200 W continuous exceeds the 1,920 W maximum on a 20 A/120 V circuit. NEC 80% derating: 20 A × 0.80 = 16 A continuous × 120 V = 1,920 W maximum. The 2,200 W load requires a 30 A circuit (24 A continuous = 2,880 W capacity) to maintain code compliance.

15. C — RT60 of 2.0 seconds is grossly excessive for conference room speech intelligibility. Conference rooms target 0.4–0.6 seconds RT60 to maintain clear speech communication. At 2.0 seconds, reverberation causes speech to blur into itself, making conversation difficult and videoconferencing nearly unusable.

16. A — 300-inch image width dramatically overfills the 120-inch screen. Throw ratio × screen width = expected result, but calculated differently: throw distance ÷ throw ratio = image width. 30 ft (360 inches) ÷ 1.2 = 300 inches projected image width versus the 104.6-inch screen. The projector is completely mismatched to the installation geometry.

17. D — SMPTE ST 2110 requires sub-microsecond PTP (IEEE 1588) synchronization. NTP provides millisecond-level accuracy, which is three orders of magnitude less precise than ST 2110 requires for frame-accurate synchronization of separate essence streams. Using NTP for ST 2110 results in audio/video sync failures and stream alignment errors.

18. B — Viewers at 3 meters see individual pixels with 4 mm pitch. The minimum ideal viewing distance rule (pitch × 3,000) yields 4 mm × 3,000 = 12,000 mm = 12 meters minimum. At 3 meters,

the pixel structure is clearly visible, creating a screen-door effect that degrades image quality perception.

19. C — Separate VLANs needed for video, control, and management AV traffic. Placing all AV-over-IP traffic on a single VLAN creates security vulnerabilities, eliminates traffic isolation, and prevents proper QoS differentiation between bandwidth-heavy video streams and latency-sensitive control traffic. Professional AV network design requires segmentation.

20. A — 10:1 safety factor is required for overhead loads above occupied space. Performance venue rigging over seated audience areas is a life-safety application requiring the highest safety factor. A 3:1 factor is appropriate only for non-overhead, non-occupied applications and creates unacceptable risk when failure could injure audience members.

21. D — UL-listed firestop assemblies required for all penetrations through fire-rated assemblies. Omitting firestop from the specification creates a life-safety code violation by compromising the fire barrier's rated integrity. Every conduit, cable tray, and sleeve penetrating a fire-rated wall or floor must be sealed with a tested and listed firestop system.

22. B — TLS 1.0 is formally deprecated due to known cryptographic vulnerabilities. Industry standards and compliance frameworks require TLS 1.2 minimum for all networked device communications. Specifying TLS 1.0 leaves AV devices vulnerable to known attacks that can compromise credentials and network security.

23. D — Tamper-evident redundant storage with archival retention required for legal recordings. Courtroom recordings serve as legal evidence that must maintain chain-of-custody integrity over multi-year retention periods. A single local hard drive provides no redundancy against drive failure, no tamper evidence for legal challenges, and no archival-grade retention capability.

24. B — CRI 90+ and tunable white 4000–5000 K needed for camera-quality video. CRI 80 produces inadequate skin tone rendering on camera, creating an unprofessional appearance for video conference participants. Warm 3500 K color temperature mismatches with daylight, producing color balance issues when ambient and artificial light mix.

25. A — Amplifier operating at 100% capacity with no headroom for reliability. Professional practice requires 25–33% headroom above continuous tap load to prevent thermal stress during sustained operation. A 90 W amplifier driving 90 W continuous will run at thermal maximum, shortening component life and risking thermal shutdown.

26. C — Analog audio degrades significantly over 500-foot cable runs. Long analog cable runs accumulate resistive loss, capacitive high-frequency rolloff, and electromagnetic interference that progressively degrade signal quality. Networked digital audio (Dante, AES67) maintains full signal integrity regardless of cable length within network specifications.

27. D — Remote participants hear echo of their own voice without acoustic echo cancellation. When in-room loudspeakers play remote participant audio, room microphones pick up that same audio

and send it back to the remote participants. Without AEC, this creates a distracting echo loop that makes conversation impossible.

28. B — Intermittent load within 20 A rating is acceptable if truly non-continuous. NEC 80% derating applies to continuous loads (3+ hours). If the 18.5 A draw is genuinely intermittent, the 20 A circuit is code-compliant. However, the designer must verify the load profile is truly intermittent rather than continuous.

29. A — Delay fills without timing produce Haas-violating conditions degrading intelligibility. Sound from both the main system and undelayed fill speakers arrives at listeners at different times, creating audible echo and image confusion. Proper delay timing (distance ÷ 343 m/s) aligns arrivals within the Haas precedence window.

30. C — Room type and use case require different specifications for each space. An executive boardroom and a converted closet huddle room have fundamentally different spatial constraints, user expectations, and functional requirements. Identical specifications waste budget in the huddle room while potentially under-serving the boardroom.

31. D — Passive HDMI typically fails beyond 15 ft (5 m) at 4K@60 Hz bandwidth. At 18 Gbps, signal attenuation in passive copper HDMI cable exceeds receiver tolerance beyond approximately 5 meters. Active optical HDMI cable, HDBaseT, or fiber extension is required for reliable 4K@60 transport at 25 feet.

32. B — 15 ft spacing exceeds 12 ft coverage diameter creating gaps between speakers. At 10 ft ceiling with 90° pattern and 6 ft drop to ear height, each speaker covers approximately 12 ft diameter. Spacing at 15 ft creates 3 ft gaps between coverage circles where SPL drops well below the ±3 dB ACU Standard tolerance.

33. A — California seismic codes require bracing for overhead-mounted equipment in occupied spaces. Seismic zones mandate that all overhead equipment be braced to prevent falling during earthquakes. Omitting seismic bracing for ceiling-mounted displays creates both code violation and life-safety hazard in earthquake-prone regions.

34. C — DSP sample rate of 48 kHz fails the 96 kHz specification requirement. Recording studios specifying 96 kHz operation need DSP processors capable of running at that sample rate. A 48 kHz DSP cannot process 96 kHz audio — the submittal must be returned for specification-compliant product.

35. D — ADA requires scaled assistive listening quantities based on seating capacity. For 500 seats, ADA scoping requires a minimum of 20 receivers (4% of 501–1000 seats) plus at least 2 neckloop receivers for hearing-aid-compatible use. The 10% figure cited in the question (50 units) actually exceeds the ADA minimum requirement.

36. A — Projector may require physical repositioning if lens shift is insufficient. Lens shift range varies by manufacturer and model; specifying a projector without verifying that its lens shift range

accommodates the required vertical and horizontal offset risks discovering during installation that the image cannot be properly positioned.

37. B — AV traffic competes with enterprise data causing video artifacts and audio dropouts. Without QoS configuration, network switches treat AV streams the same as email, file transfers, and web browsing. During peak traffic periods, AV packets are delayed or dropped, producing visible video tearing and audible audio interruptions.

38. D — NEC limits three-or-more conductors to 40% conduit fill. Six Cat6A cables constituting three or more conductors must not exceed 40% of the conduit's internal cross-sectional area. A 50% fill violates NEC Chapter 9 fill requirements and creates excessive heat buildup and pulling difficulty during installation.

39. C — Under 500 ms response time target required for acceptable user experience. A 3-second response to touch creates perceived system unresponsiveness, causing users to press buttons repeatedly and creating operational confusion. Professional control systems should respond in under 500 ms to feel immediate and intuitive.

40. A — HDCP chain fails when any output port lacks HDCP 2.2 compliance. Protected 4K UHD content requires HDCP 2.2 at every point in the signal chain from source through distribution to display. HDCP 1.4 outputs break the chain, causing content to blank or downgrade to unprotected lower resolution.

41. B — Simultaneous power-on inrush current may trip the circuit breaker. Amplifiers draw 5–10× their steady-state current during initial power-on. Eight amplifiers starting simultaneously can produce inrush current far exceeding the circuit breaker's instantaneous trip threshold, causing immediate power loss.

42. D — Structural backing and engineering required for 200-pound concentrated loads. Standard drywall with toggle bolts is rated for roughly 30–50 pounds maximum. A 200-pound video wall requires structural blocking, plywood backing, or steel unistrut installed during wall construction and verified by the structural engineer.

43. A — 100 meters is HDBaseT's maximum specified distance at any resolution. Even at 1080p, HDBaseT does not reliably operate beyond 100 meters on Cat6A cable. The 120-meter specification violates the protocol's fundamental distance limitation and will produce unreliable signal delivery.

44. C — Weather-rated speakers with appropriate IP rating required for outdoor wet environments. Pool areas present water exposure, humidity, temperature extremes, and UV degradation that destroy indoor-rated equipment within weeks or months. IP65 or higher rated speakers with corrosion-resistant hardware are mandatory for outdoor wet environments.

45. A — Specification should define required parts and labor warranty duration independently. Manufacturer warranties vary from 1 to 5 years and may cover parts only. The specification must

state the project's required warranty terms (typically 2 years parts and labor) to ensure the integrator provides coverage meeting project requirements.

46. C — 70V transformer insertion loss and frequency response limitations degrade audio quality. The step-up/step-down transformers in 70V systems introduce measurable frequency response deviations, particularly at high and low frequency extremes. Critical listening environments require the full-bandwidth performance of direct low-impedance amplifier-to-speaker connections.

47. D — Afternoon sunlight through west-facing windows destroys ISCR for projection. Uncontrolled daylight can contribute hundreds of lux to the screen surface, reducing ISCR well below any useful viewing task category. Ambient light control (motorized shades, film, or screen relocation) must be specified alongside projection systems.

48. B — Switch PoE budget of 370 W cannot power 510 W total camera load. Twenty cameras at 25.5 W each require 510 W from the switch's PoE budget. The 370 W budget falls 140 W short, meaning approximately 5–6 cameras will fail to receive power. A switch with 600+ W PoE budget or supplemental midspan injectors is required.

49. A — Fire alarm integration must override and mute AV audio during emergency notification. Building codes require that emergency notification audio take priority over all other audio sources. Without this integration, AV background music or paging could mask fire alarm messages during evacuation, creating a life-safety hazard.

50. C — Mission-critical systems require redundant control with automatic failover. A single control processor failure in a broadcast facility takes the entire operation offline. Redundant processors with automatic failover ensure continuous operation when the primary processor fails, maintaining broadcast continuity.

51. D — 1.6 ohms cable resistance on 8-ohm load produces approximately 20% power loss. Loss ratio: 1.6/(8 + 1.6) = 16.7%, approximately 20% with rounding. This far exceeds the 0.5 dB (approximately 10%) industry target. Heavier gauge cable (12 AWG or 10 AWG) is required for this run length.

52. B — DHCP reassignment can break AV device communication requiring static IP or reservations. AV devices configured with specific IP addresses in control system programming lose connectivity if DHCP assigns different addresses. Static IP assignment or DHCP reservations ensure AV devices maintain consistent addresses.

53. A — ADA requires assistive listening systems in assembly spaces with fixed seating. A 200-seat lecture hall is an assembly space requiring hearing assistance per ADA. Omitting this requirement creates a federal accessibility compliance violation that must be corrected before occupancy.

54. D — Plenum-rated CL2/CL3 or CMP cables required per NEC for in-wall and plenum installations. Consumer HDMI cables lack the fire-retardant jacket ratings required by NEC for

installation within walls and above ceilings. Using non-rated cables in these spaces creates a fire code violation.

55. C — Equipment overheats without specified ventilation in sealed racks and small closets. Sealed racks in confined spaces create thermal hot spots that accelerate component failure and can trigger thermal shutdown. The specification must define ventilation requirements, cooling capacity, and maximum ambient temperature.

56. A — Display significantly exceeds Passive requirement — verify actual viewing task need. DISCAS Passive at 8 ft requires only 12-inch image height; the 42-inch display dramatically exceeds this. The designer should verify whether the actual viewing task is BDM (requiring 16 inches) or ADM (requiring 24 inches) to properly justify the display selection.

57. B — 500 ms exceeds the 150 ms video conferencing latency target by more than 3×. At 500 ms end-to-end latency, conversational participants experience half-second delays that disrupt natural turn-taking, cause talking over each other, and make interactive discussion extremely frustrating. The codec specification must meet the 150 ms threshold.

58. D — Fiber requires minimum 10× cable diameter bend radius to prevent damage. Bending fiber optic cable to 3× diameter causes micro-bending that introduces signal loss or complete fiber breakage. Conduit routing must accommodate the larger bend radii that fiber cables require at every turn and junction.

59. C — Displays appear visually inconsistent without calibration targets and Delta E tolerance. When multiple displays are viewed simultaneously (conference rooms, video walls, lobbies), color temperature and brightness variations are immediately noticeable. Specification of calibration targets, Delta E tolerance, and recalibration schedule ensures visual consistency.

60. A — RF coordination identifies interference sources and available frequencies preventing dropouts. Dense urban venues contain numerous RF sources (other wireless systems, cellular, building systems) that occupy frequency bands the wireless microphone system needs. Coordination analysis maps the RF environment and identifies clean operating frequencies.

61. B — 12 AWG is undersized for 30 A circuits per NEC conductor sizing requirements. NEC Table 310.16 specifies 10 AWG copper minimum for 30 A overcurrent protection. Using 12 AWG (rated for 20 A maximum) creates an overheated conductor that represents a serious fire hazard.

62. D — IT policy may prohibit devices or require specific VLAN, QoS, and security configuration. Enterprise networks have established policies governing device access, network segmentation, and security requirements. Placing AV devices on the network without IT coordination may violate security policies, create network vulnerabilities, or result in IT blocking the devices entirely.

63. A — Signal flow diagrams communicate system architecture preventing installation ambiguity. Without signal flow documentation, integrators must interpret system intent from equipment lists

and incomplete schematics. This leads to incorrect signal routing, missing connections, and costly rework during installation and commissioning.

64. C — 3,000 K produces warm orange cast on camera degrading professional video quality. Video cameras are calibrated for daylight-equivalent color temperatures (4,000–5,000 K). Warm 3,000 K lighting shifts skin tones toward orange/yellow on camera, creating an unprofessional appearance for video conference participants.

65. B — Non-technical access risks accidental damage requiring enclosed locked racks. Open-back racks in accessible spaces expose cabling, power connections, and equipment to untrained personnel who may disconnect cables, obstruct airflow, or create safety hazards. Enclosed racks with locked doors protect both equipment and personnel.

66. D — 54-inch video wall height fails 120-inch BDM requirement at 60 ft viewing. DISCAS BDM: 60 ft × 12 = 720 inches ÷ 6 = 120 inches minimum image height. The 54-inch wall is less than half the required height. A significantly larger configuration (minimum 4-high arrangement) is needed.

67. C — Unsegmented networks create cross-system attack vectors between AV and building automation. Without network segmentation, a compromised AV device provides a pathway to attack building automation systems (HVAC, access control, lighting). Segmented networks with appropriate firewall rules contain security incidents within their originating network segment.

68. A — 15 ft camera height creates steep downward angle producing unflattering participant framing. High-mounted cameras look down on seated participants, capturing the tops of heads rather than faces at eye level. Optimal conference camera height is approximately 4–5 feet (seated eye level) for natural-looking video framing.

69. D — AV and appliance loads must be on separate circuits to prevent interference. Microwave ovens draw high current intermittently, causing voltage fluctuations on the shared circuit that produce audible artifacts in audio equipment and visible disturbances in video displays. Dedicated circuits isolate sensitive AV equipment from noisy appliance loads.

70. B — 4K benefit imperceptible at 25 ft on 55-inch display making 1080p sufficient. At 25 feet from a 55-inch display, human visual acuity cannot distinguish 4K from 1080p resolution. Specifying 4K increases cost without visible benefit; 1080p provides equivalent perceived quality at this viewing distance.

71. A — Owner receives source code to enable future modifications independently. Without control system source code and programming documentation, the owner cannot modify room configurations, update device commands, or troubleshoot programming issues. Permanent dependency on the original integrator for any system change creates operational vulnerability and cost exposure.

72. C — 80 dBA is excessively loud for restaurant dining conversation. Typical background music in dining environments ranges from 55–65 dBA, which allows comfortable conversation at normal

voice levels. At 80 dBA, diners must raise their voices to near-shouting levels to be heard, creating an unpleasant dining experience.

73. D — Nurse call integration required for coordinated patient care communication. Hospital paging systems must integrate with nurse call to ensure clinical staff receive patient alerts through both systems. Standalone paging that doesn't coordinate with nurse call creates communication gaps in patient care workflows.

74. B — Mission-critical equipment requires UPS with surge protection not consumer power strips. Consumer power strips provide minimal surge protection and no battery backup. Broadcast equipment failure during a power event can take a station off-air; UPS provides clean, uninterrupted power through utility disturbances.

75. A — Flutter echo between parallel hard surfaces degrades speech intelligibility. Parallel reflective surfaces create rapid repetitive reflections (flutter echo) that smear speech and create audible artifacts. Acoustic treatment on at least one parallel surface breaks the reflection pattern and eliminates this common acoustic defect.

76. C — 4K streams require Gigabit or higher bandwidth that 100 Mbps cannot provide. Even compressed 4K AV-over-IP streams typically consume 500 Mbps to 1 Gbps per stream. A 100 Mbps switch port cannot carry even a single 4K stream, making the network infrastructure completely inadequate for the specified system.

77. D — 45 dBA projector fan noise exceeds NC-25 room ambient creating audible intrusion. In a quiet NC-25 room (approximately 33 dBA ambient), a projector producing 45 dBA adds noticeable mechanical noise that occupants can clearly hear during quiet moments. A quieter projector or remote projector placement is required.

78. B — Senior users need larger fonts and simplified high-contrast interfaces for accessibility. Age-related vision changes reduce the ability to read small text, particularly on backlit screens. Touch panels in senior living facilities require 14+ point minimum fonts, high-contrast color schemes, and simplified layouts with fewer choices per screen.

79. A — Smoke detection required per code for equipment rooms with concentrated electrical loads. AV equipment rooms contain multiple electrical devices that can overheat, short-circuit, or ignite. Building codes require smoke detection in these spaces to provide early warning before a fire develops beyond its origin point.

80. C — DSP input count insufficient for the project's 12-channel requirement. An 8-channel DSP physically cannot accept 12 simultaneous input channels. The specification must be corrected to a 12-channel or larger DSP, or a second DSP must be added to handle the overflow channels.

81. D — Signal class separation required between audio, video, and data cables. Co-mingling signal classes in cable trays creates electromagnetic interference between cable types. Audio cables are particularly susceptible to interference from data cables, producing audible noise and artifacts.

82. B — Conference room speakers lack SPL and coverage capability for gymnasium applications. Gymnasium acoustic environments require loudspeakers with higher output capability, wider coverage patterns, and weather-resistant construction that conference room models don't provide. Specifying identical models for both spaces results in inadequate gymnasium coverage.

83. A — IT coordination documents VLAN, QoS, IP addressing, and security requirements across all 40 rooms. Enterprise-scale AV deployment requires structured IT coordination to ensure consistent network configuration. Without documented IT requirements, each room may receive inconsistent network treatment, creating troubleshooting nightmares and potential security gaps.

84. C — Amplifier exceeding 2× speaker continuous rating risks speaker damage during peaks. A 200 W amplifier can deliver transient peaks that exceed the 75 W speaker's thermal and mechanical limits. Industry practice recommends amplifier power between 1× and 2× the speaker's continuous rating (75–150 W) for safe operation with adequate headroom.

85. D — Multiple cables required to prevent single point of failure and bandwidth limitation. A single Cat6A cable carrying all signals creates complete room failure if that cable is damaged. Separate cables for video, audio/control, and network provide redundancy and ensure adequate bandwidth for each signal type.

86. B — 3,000 lumens insufficient for high ambient light requiring 5,000+ lumens or light control. A room with 500 lux ambient light washes out projection from a 3,000-lumen projector, producing ISCR well below BDM threshold. Either significantly higher lumen output or ambient light control is required.

87. A — As-built drawings document actual installed condition for future service and modification. Without as-built documentation, future technicians cannot locate equipment, trace signal paths, or identify cable routing when servicing or modifying the system. As-built drawings are essential operational documents that maintain long-term system serviceability.

88. C — Enterprise-grade wireless with dedicated SSID needed for reliable high-density presentation. Consumer Wi-Fi access points cannot handle the RF density and bandwidth demands of 50 simultaneous devices. Enterprise-grade wireless with dedicated SSID, band steering, and QoS ensures reliable wireless presentation performance.

89. B — Without operational scenarios the programmer interprets user needs creating UX mismatch. Control system programmers who lack documented scenarios must guess what each button does, how rooms transition between modes, and what users expect to happen. This interpretation gap produces user interfaces that don't match actual operational workflows.

90. D — 10 Gbps uplink with 1 Gbps access ports prevents port-to-uplink congestion. Individual AV devices typically operate within 1 Gbps per-port capacity, but aggregate traffic from multiple devices can overwhelm a 1 Gbps uplink. The 10 Gbps uplink provides the backbone bandwidth that prevents congestion when multiple streams are active simultaneously.

91. A — Single-point ground required to prevent ground loops producing audible hum. Broadcast facilities are extremely sensitive to ground-loop-induced noise. Without a specified single-point grounding plan, multiple ground paths through different rack frames create potential differences that couple directly into audio signals.

92. C — 10 mm pixel pitch requires 30 m minimum viewing distance showing obvious pixel grid at 8 ft. Rule: 10 mm × 3,000 = 30,000 mm = 30 meters minimum. At 8 feet (2.4 m), viewers are more than 12× closer than the minimum ideal distance, making individual pixels blatantly visible and rendering the display unsuitable for the application.

93. D — HIPAA compliance mandatory for telehealth including encrypted transport and audit logging. Healthcare video consultation involves protected health information that falls under HIPAA security requirements regardless of the platform used. Encrypted signal transport, access controls, and audit logging are mandatory, not optional, for telehealth AV systems.

94. B — 300 ft low-impedance cable run produces significant resistive loss degrading audio quality. Long low-impedance speaker cable runs accumulate resistance that wastes amplifier power as heat and reduces damping factor. Professional practice locates amplifiers near loudspeakers, using networked digital audio (Dante/AES67) for the long signal transport.

95. A — Undersized conduit causes installation damage and exceeds NEC fill requirements. Without calculating the total cable cross-sectional area against NEC 40% fill limits, the conduit may be too small, causing cable damage during pulling and thermal issues during operation. Fill calculations must be performed before conduit trade size is specified.

96. C — Different room volumes and RT60 require different EQ, delay, and processing parameters. A lecture hall and a gymnasium have dramatically different acoustic characteristics that require individually tuned DSP configurations. Identical processing ignores the room acoustics that fundamentally shape how the system sounds to listeners.

97. D — Projector lamps degrade in storage requiring shelf life specification for usable spare stock. Lamp chemistry deteriorates over time even when not in use, potentially causing reduced brightness or failure when finally installed. Specifying shelf life ensures replacement lamps remain viable when needed.

98. A — Bandwidth verification prevents video quality degradation during peak network utilization. Video conferencing codecs require sustained bandwidth availability; competing traffic during peak hours can force codec quality reduction or cause connection drops. Pre-deployment bandwidth assessment with IT prevents these operational problems.

99. B — Users cannot effectively operate the system without specified training. Complex AV systems with multiple modes, sources, and configurations require structured training for users to operate them confidently. Without training, systems are underutilized or misused, defeating the design's purpose.

100. C — Critical distance exceeded causing microphone to capture reverberant energy. In a room with 1.5-second RT60, the critical distance (where direct and reverberant sound are equal) is relatively short. A microphone at 10 feet in this reverberant room captures predominantly room reflections rather than direct speech, severely degrading intelligibility.

101. D — VGA is obsolete technology inappropriate for new construction projects. Analog VGA cannot transport 4K content, lacks audio embedding, and offers no content protection. Modern AV design requires digital transport (HDMI, HDBaseT, AV-over-IP) to support current and future content requirements.

102. A — PoE voltage drop at 100 m reduces available power requiring verification. Maximum Cat6A distance coincides with maximum PoE voltage drop (approximately 15% power reduction). The designer must verify that the touch panel can operate within the derated power budget available at the maximum cable distance.

103. B — Surge protection prevents voltage transients from damaging sensitive AV equipment. Power line transients from lightning, utility switching, and building electrical events produce voltage spikes that can permanently damage sensitive AV electronics. Surge protection devices clamp these transients to safe levels before they reach equipment.

104. C — 4K provides visible detail benefit for large-format IMAG displays at extended distances. When IMAG screens are large and viewing distances create favorable angular resolution, 4K cameras capture detail that 1080p cameras cannot resolve. This is particularly beneficial for close-up shots on large-format LED screens in performance venues.

105. A — STI verification confirms speech intelligibility meets the 0.70+ specification target. Without measured STI data, the designer cannot verify that the installed system achieves the specified intelligibility performance. STI measurement using calibrated equipment provides objective evidence that the speech reinforcement system meets its design intent.

106. D — Nighttime audio disrupts patient rest requiring zoned control and scheduling. Hospital patient care protocols specify quiet periods for healing and sleep. Background music playing through patient room speakers at night violates clinical best practices and may interfere with patient monitoring alarms.

107. B — 16:9 aspect ratio required for widescreen content and video conferencing. A 4:3 screen displaying 16:9 content wastes approximately 25% of the screen area as black letterbox bars above and below the image. Since the room uses exclusively widescreen sources, a 16:9 screen maximizes usable display area.

108. A — Multi-platform wireless support (AirPlay, Miracast, Chromecast) required for BYOD environments. Corporate environments include Apple, Windows, Android, and Chrome devices. An AirPlay-only gateway excludes the majority of non-Apple users, defeating the BYOD purpose and requiring additional equipment or workarounds.

109. C — Battery replacement schedule prevents unannounced UPS failure from degraded batteries. UPS batteries typically last 3–5 years before capacity degrades below useful levels. Without a scheduled replacement program, the UPS may fail to provide expected backup runtime during an actual power event, leaving mission-critical equipment unprotected.

110. D — Server fan noise contaminates AV audio requiring separate rooms or acoustic isolation. Server rooms produce 60–75 dBA of continuous fan noise that will be captured by any microphone in the same space. AV equipment rooms must be acoustically isolated from noisy server equipment to prevent audio contamination.