PRACTICE EXAM 10: CTS-D SIMULATION (110 QUESTIONS)

Time Limit: 180 minutes | Passing Score: 70%

1. The DISCAS divisor for Basic Decision Making is:

A. 6

B. 4

C. 8

D. 3

2. ISCR for Analytical Decision Making per V201.01:2021 is:

A. 15:1

B. 30:1

C. 50:1

D. 80:1

3. ACU Standard grade specifies:

A. ±1 dB

B. ±3 dB

C. ±6 dB

D. ±9 dB

4. HDMI 2.0 maximum bandwidth is:

A. 10 Gbps

B. 18 Gbps

C. 32 Gbps

D. 18 Gbps

5. NEC continuous load derating rule limits loads to:

A. 80% of breaker rating

B. 70% of breaker rating

C. 90% of breaker rating

D. 100% of breaker rating

6. HDBaseT at 4K@60 Hz 4:4:4 typically reaches:

A. 100 meters

B. 50 meters

C. 70 meters

D. 125 meters

7. DSCP 46 (EF) is for:

A. Video conferencing

B. Management traffic

C. Best-effort data

D. Real-time audio/VoIP

8. Speed of sound at room temperature is:

A. 300 m/s

B. 343 m/s

C. 400 m/s

D. 380 m/s

9. PoE+ (IEEE 802.3at) delivers at device:

A. 25.5 W

B. 30 W

C. 40 W

D. 51 W

10. Conduit fill for three or more conductors is:

A. 53%

B. 31%

C. 40%

D. 60%

11. Typical speech reinforcement headroom is:

A. 3 dB

B. 20 dB

C. 6 dB

D. 10 dB

12. NOM penalty for doubling open microphones is:

A. 1 dB

B. 3 dB

C. 6 dB

D. 10 dB

13. Parallel impedance of four 16-ohm speakers:

A. 4 ohms

B. 8 ohms

C. 16 ohms

D. 2 ohms

14. A 20 A continuous load requires minimum breaker size of:

A. 20 A

B. 22 A

C. 25 A

D. 30 A

15. Dante latency over Gigabit Ethernet:

A. 5 ms

B. 10 ms

C. 50 ms

D. Sub-millisecond

16. Standard rack unit (1U) height is:

A. 1.5 inches

B. 1.75 inches

C. 2.0 inches

D. 2.5 inches

17. SMPTE ST 2110 synchronization requirement is:

A. Sub-microsecond PTP

B. Millisecond NTP

C. 1 microsecond GPS

D. Manual time sync

18. Typical Cat6A bend radius minimum:

A. 4x cable diameter

B. 6x cable diameter

C. 6x cable diameter

D. 10x cable diameter

19. BTU conversion from watts uses:

A. 2.412

B. 3.412

C. 4.412

D. 5.412

20. ANSI/AVIXA V202.01 addresses:

A. Image contrast

B. Coverage uniformity

C. Performance verification

D. Image sizing

21. Typical training room RT60 target:

A. 0.4–0.6 seconds

B. 1.0 seconds

C. 1.5 seconds

D. 2.0 seconds

22. HDCP version required for protected 4K UHD:

A. 1.4

B. 2.0

C. 2.2

D. 2.3

23. Anti-aliasing filters prevent:

A. EMI on digital signals

B. Ground loops

C. Signal above Nyquist frequency

D. Clock jitter

24. Dante maximum channels per Gigabit link:

A. 512

B. 384

C. 256

D. 128

25. TLS minimum for modern AV security:

A. 1.0

B. 1.1

C. 1.3

D. 1.2

26. Rec. 709 color space serves:

A. 4K HDR content

B. HDTV 1080p

C. Cinema P3

D. Standard definition

27. Typical meeting room RT60 target:

A. 0.4–0.6 seconds

B. 1.0 second

C. 1.5 seconds

D. 2.5 seconds

28. ANSI/AVIXA V201.01 addresses:

A. Design coordination

B. Image sizing

C. Image System Contrast Ratio

D. Performance verification

29. Haas effect precedence window:

A. 1–3 ms

B. 10–12 ms

C. 50–100 ms

D. 5–35 ms

30. Typical broadcast lip-sync tolerance:

A. Under 40 ms

B. Under 100 ms

C. Under 200 ms

D. Under 500 ms

31. ANSI/AVIXA 10:2013 AVSPV addresses:

A. Image sizing

B. Performance verification

C. Coverage uniformity

D. Energy management

32. A 70V distributed system of 10 speakers at 3 W each requires amplifier:

A. 20 W minimum

B. 25 W minimum

C. 30 W minimum

D. 40 W minimum

33. Typical commercial display for 24/7 operation:

A. Consumer 4K TV

B. Home theater display

C. Commercial-grade continuous-duty

D. Gaming monitor

34. STI minimum for "good" speech quality:

A. 0.75

B. 0.60

C. 0.45

D. 0.30

35. Maximum continuous load on 30 A circuit:

A. 30 A

B. 28.5 A

C. 27 A

D. 24 A

36. HDMI 2.1 maximum bandwidth:

A. 18 Gbps

B. 48 Gbps

C. 25 Gbps

D. 100 Gbps

37. Typical IMAG latency target:

A. Under 100 ms

B. Under 50 ms

C. Under 200 ms

D. Under 500 ms

38. A 4K display showing blue tint indicates:

A. HDCP configuration

B. Video codec issue

C. Display color temp misconfiguration

D. Source color settings

39. DALI-1 devices per circuit:

A. 12

B. 32

C. 128

D. 64

40. Speed of sound produces delay of:

A. 1 ms per foot

B. 2.9 ms per meter

C. 5 ms per foot

D. 10 ms per meter

41. Typical broadcast studio RT60:

A. Under 0.5 seconds

B. 1.0 seconds

C. 1.5 seconds

D. 2.0 seconds

42. CRI minimum for video conferencing:

A. 70

B. 80

C. 90

D. 100

43. APEx 2M-2010 addresses:

A. Image sizing

B. Design coordination

C. Performance verification

D. Coverage uniformity

44. ACU High grade specifies:

A. ±3 dB

B. ±6 dB

C. ±9 dB

D. ±1 dB

45. Parallel impedance of two 4-ohm speakers:

A. 4 ohms

B. 2 ohms

C. 6 ohms

D. 8 ohms

46. Typical IEEE 802.3at distance reduction at 100 m:

A. None

B. 5%

C. 10%

D. 15%

47. Class D amplifier efficiency:

A. 80–95%

B. 50–60%

C. 60–70%

D. 100%

48. Typical DCI cinema frame rate:

A. 30 fps

B. 60 fps

C. 24 fps

D. 25 fps

49. ANSI/AVIXA AVSEM addresses:

A. Image sizing

B. Energy management

C. Coverage uniformity

D. Performance verification

50. Typical courtroom AV recording retention:

A. 30 days

B. 90 days

C. 6 months

D. Years per jurisdiction

51. PoE++ Type 4 maximum delivered power:

A. 71 W

B. 51 W

C. 30 W

D. 25.5 W

52. Typical hospital clinical RT60:

A. 0.3 seconds

B. 1.0 seconds

C. 0.5–0.8 seconds

D. 1.5 seconds

53. TEMPEST rating addresses:

A. Fire resistance

B. Temperature tolerance

C. Audio isolation

D. Electromagnetic emanations security

54. Typical HDMI passive cable limit at 4K@60:

A. 3 meters

B. 5 meters

C. 10 meters

D. 15 meters

55. IGMP snooping prevents:

A. Multicast flooding

B. DHCP conflicts

C. VLAN broadcasting

D. DNS failures

56. Typical Class 2 cable Cat6A maximum frequency:

A. 100 MHz

B. 250 MHz

C. 500 MHz

D. 1000 MHz

57. Typical DCI cinema color space:

A. Rec. 2020

B. DCI-P3

C. Rec. 709

D. Rec. 601

58. The DMX-512 protocol uses:

A. RS-232

B. Ethernet

C. Fiber optic

D. RS-485

59. Typical convention center noise criterion:

A. NC-45

B. NC-25

C. NC-35

D. NC-55

60. Typical Delta E target for general corporate:

A. Under 1

B. Under 2

C. Under 5

D. Under 10

61. SMPTE 2110-30 carries:

A. Compressed audio

B. Uncompressed PCM audio

C. Dolby Atmos only

D. MP3 streams

62. Typical commissioning timeline for medium system:

A. 1 day

B. 3 days

C. 1 week

D. 2 weeks

63. Typical ISCR for Passive Viewing:

A. 7:1

B. 15:1

C. 30:1

D. 50:1

64. Typical ISCR for Full Motion Video:

A. 7:1

B. 15:1

C. 80:1

D. 50:1

65. Typical A/B subwoofer phase response at crossover:

A. 0 degrees

B. 180 degrees

C. 270 degrees

D. 90 degrees phase

66. Typical speaker cable loss upper limit:

A. 0.2 dB

B. 0.5 dB

C. 1.0 dB

D. 2.0 dB

67. A 4-channel amplifier at 75% efficiency with 500 W output draws:

A. 667 W input

B. 550 W input

C. 750 W input

D. 350 W input

68. Typical building STC for speech privacy:

A. STC 20

B. STC 30

C. STC 40+

D. STC 70

69. AES67 is:

A. Dante's native protocol

B. AoIP interoperability standard

C. Proprietary to specific brand

D. Consumer audio

70. Ground loops are mitigated through:

A. More cables

B. Unbalanced connections

C. Reduced levels

D. Balanced interconnections and shielding

71. The Sabine formula RT60 imperial coefficient:

A. 0.049

B. 0.161

C. 0.08

D. 0.25

72. Typical UPS transition for online double-conversion:

A. 20 ms

B. 100 ms

C. Zero transition

D. 5 ms

73. Typical SMPTE 2110 uncompressed 4K stream:

A. 3 Gbps

B. 12 Gbps

C. 18 Gbps

D. 25 Gbps

74. Typical multimode fiber max for 4K AV-over-IP:

A. 100 meters

B. 500 meters

C. 1000 meters

D. 300 meters

75. Substantial completion walk-through generates:

A. Punchlist

B. As-built drawings

C. Closeout

D. Warranty

76. Typical PTP synchronization for ST 2110:

A. Millisecond

B. 10 microseconds

C. Sub-microsecond

D. 1 millisecond

77. Typical commercial daylight-readable display:

A. 250 nits

B. 700+ nits

C. 500 nits

D. 1500 nits

78. Typical tunable white LED range:

A. 2000-3000 K

B. 3000-5000 K

C. 4000-7000 K

D. 3000-5000 K

79. Typical AEC tail length matches:

A. Room RT60

B. Microphone sensitivity

C. DSP settings

D. Room size

80. The Haas effect precedence requires:

A. 10-100 ms arrival difference

B. 0-10 ms only

C. Within 5-35 ms window

D. Above 100 ms

81. Typical hospital operating room display standard:

A. Consumer TV

B. Gaming monitor

C. Commercial standard

D. DICOM-calibrated medical-grade

82. Typical isolated ground receptacle per NEC:

A. Green hex

B. Orange triangle

C. Red dot

D. Blue square

83. A confused punchlist "display inconsistently dimming":

A. Defective work requiring remediation

B. Cosmetic issue

C. Incomplete work

D. User error

84. Typical Dante channels per Gigabit link:

A. 128

B. 256

C. 512

D. 384

85. Typical cable labeling per RP-38-17:

A. Handwritten

B. Adhesive tape

C. Color-only

D. Heat-shrink printed

86. Typical STI for "poor" speech:

A. Above 0.60

B. Below 0.45

C. 0.75

D. Above 0.80

87. Typical 1" EMT internal area:

A. 0.864 sq in

B. 0.5 sq in

C. 0.625 sq in

D. 1.2 sq in

88. Typical lobby brightness for daylight:

A. 250 nits

B. 500 nits

C. 1000 nits

D. 700+ nits

89. AES3 uses connector type:

A. BNC

B. TRS

C. 3-pin XLR

D. RCA

90. Typical fiber optic cable bend radius:

A. 10x cable diameter

B. 5x cable diameter

C. 8x cable diameter

D. 15x cable diameter

91. Typical speaker line power dissipation ratio for amplifier:

A. 25% cable loss acceptable

B. 50% cable loss acceptable

C. 5% cable loss acceptable

D. Below 1 dB cable loss

92. Typical Cat6A maximum frequency:

A. 100 MHz

B. 500 MHz

C. 250 MHz

D. 1000 MHz

93. Typical HDMI eARC requires:

A. HDMI 2.1 support

B. HDMI 2.0

C. HDCP 2.2

D. Audio return channel

94. Typical sanctuary STI target:

A. 0.45

B. 0.60

C. 0.70+

D. 0.30

95. A typical 4K@60 Hz 4:2:0 10-bit uncompressed:

A. 15 Gbps

B. 18 Gbps

C. 12 Gbps

D. 10 Gbps

96. Typical Class 2 firestop for rated penetrations:

A. Generic caulking

B. UL-listed firestop assembly

C. Painted coating

D. Foam insulation

97. Typical voltage drop over 100 ft of 12 AWG at 20 A:

A. 1-2%

B. 5%

C. 10%

D. 20%

98. Typical video conferencing latency target:

A. Under 50 ms

B. Under 100 ms

C. Under 150 ms

D. Under 500 ms

99. Typical conference table mic polar pattern:

A. Omnidirectional

B. Cardioid

C. Figure-8

D. Shotgun

100. Typical AV-over-IP compressed 4K stream:

A. 100 Mbps

B. 2 Gbps

C. 5 Gbps

D. 500 Mbps to 1 Gbps

101. Typical SMPTE color bars test purpose:

A. Calibration reference

B. Audio sync

C. Bandwidth test

D. EDID check

102. IEEE 1588 is also known as:

A. AES67

B. Dante

C. PTP (Precision Time Protocol)

D. NTP

103. Typical broadcast master UPS runtime:

A. 5 minutes

B. 30+ minutes

C. 10 minutes

D. 20 minutes

104. Typical direct-view LED for 5-meter viewing:

A. 5 mm pitch

B. 10 mm pitch

C. 20 mm pitch

D. 1.5–2 mm pitch

105. Typical power factor in modern AV equipment:

A. 0.90+ (corrected)

B. 0.75

C. 0.60

D. Below 0.50

106. Typical corporate boardroom security:

A. Consumer equipment

B. Standard office

C. Encrypted signal transport with isolated AV network

D. Cloud-based system

107. Typical touch panel response for good UX:

A. 1-2 seconds

B. Under 500 ms

C. 3-5 seconds

D. 10+ seconds

108. Typical stadium pixel pitch for 30-meter viewing:

A. 1.5 mm

B. 3 mm

C. 5 mm

D. 6+ mm

109. Typical video conference camera FoV for 25 ft:

A. 90 degrees

B. 60 degrees

C. 30 degrees

D. 120 degrees

110. Typical Class D efficiency range:

A. 50-60%

B. 60-70%

C. 80-95%

D. 100%

PRACTICE EXAM 10: ANSWER KEY AND EXPLANATIONS

1. A — 6 is the DISCAS divisor for Basic Decision Making. The formula calculates minimum image height as viewing distance divided by 6, ensuring content remains legible for tasks requiring basic decisions from displayed information. Analytical Decision Making uses a divisor of 4, while Passive Viewing uses 8.

2. C — 50:1 Analytical Decision Making ISCR per ANSI/AVIXA V201.01:2021. This contrast ratio supports tasks requiring detailed image analysis such as reading spreadsheets, reviewing architectural drawings, or analyzing medical images. The standard defines four tiers: Passive 7:1, BDM 15:1, ADM 50:1, and Full Motion Video 80:1.

3. B — ±3 dB defines ACU Standard grade per ANSI/AVIXA A102.01:2017. This tolerance means the SPL variation across all listener positions must not exceed 3 dB above or below the target level. ACU High (±1 dB) serves critical listening environments, while ACU Basic (±6 dB) covers general background coverage.

4. D — 18 Gbps is HDMI 2.0 maximum bandwidth. This capacity supports 4K@60 Hz at 8-bit 4:4:4 color or 4K@60 Hz at 10-bit 4:2:0 color. HDMI 2.1 extends to 48 Gbps for higher resolution and frame rate combinations.

5. A — 80% of breaker rating per NEC continuous load derating. Any circuit operating continuously for 3 or more hours must not exceed 80% of the overcurrent protection device rating. This prevents thermal accumulation in conductors and breakers that could lead to nuisance trips or fire hazard.

6. C — 70 meters is the typical HDBaseT distance at 4K@60 Hz 4:4:4. The commonly cited 100-meter figure applies only at 1080p resolution. Higher bandwidth signals reduce reliable transmission distance due to increased signal attenuation in the category cable.

7. D — DSCP 46 (Expedited Forwarding) marks real-time audio and VoIP traffic for highest priority queuing. This marking instructs network equipment to provide minimum latency and jitter treatment. Video conferencing typically uses AF41 (DSCP 34), while best-effort traffic uses DSCP 0.

8. B — 343 m/s is the speed of sound at room temperature (approximately 20°C). This converts to approximately 1.13 feet per millisecond or 2.9 milliseconds per meter. Designers use this value to calculate delay times for distributed loudspeaker systems and Haas-effect timing alignment.

9. A — 25.5 W is the power delivered at the powered device for PoE+ (IEEE 802.3at). The power sourcing equipment provides 30 W, but cable resistance consumes approximately 4.5 W over the maximum 100-meter run. PoE++ Type 3 delivers 51 W and Type 4 delivers 71 W at the device.

10. C — 40% conduit fill for three or more conductors per NEC Chapter 9. This fill percentage prevents heat buildup and ensures cables can be pulled without damage. One conductor allows 53% fill and two conductors allow 31% fill.

11. D — 10 dB headroom is the standard for speech reinforcement systems. This margin accommodates the dynamic range of human speech without distortion during louder passages or emphasis. Music reinforcement typically requires 15–20 dB headroom due to wider dynamic range.

12. B — 3 dB NOM penalty per doubling of open microphones. The formula is $10 \times \log_{10}(N)$, where N is the number of open microphones. Each doubling (2, 4, 8, 16) adds 3 dB of potential feedback gain before oscillation, which is why automatic microphone mixers are essential in multi-mic installations.

13. A — 4 ohms parallel impedance for four 16-ohm speakers. The formula $1/R_{total} = 1/R1 + 1/R2 + 1/R3 + 1/R4$ yields $1/R_{total} = 4/16$, so $R_{total} = 4$ ohms. Amplifiers must be rated for the resulting parallel load to avoid thermal shutdown or damage.

14. C — 25 A minimum breaker for a 20 A continuous load. The NEC 80% derating rule requires dividing the continuous load by 0.80: $20 \div 0.80 = 25$ A. This ensures the breaker operates within its thermal rating during extended operation periods.

15. D — Sub-millisecond latency is Dante's hallmark over Gigabit Ethernet. Typical Dante latency settings range from 150 microseconds to 5 milliseconds depending on network complexity. This performance enables live performance applications where latency must remain well below the audible threshold.

16. B — 1.75 inches is the height of one standard rack unit (1U). A standard 42U rack therefore stands $42 \times 1.75 = 73.5$ inches tall. This universal sizing standard ensures equipment interoperability across all professional rack manufacturers.

17. A — Sub-microsecond PTP (IEEE 1588) synchronization is required for SMPTE ST 2110 operation. This precision timing enables frame-accurate alignment of separate audio, video, and metadata essence streams across the network. Without sub-microsecond accuracy, uncompressed professional media streams cannot maintain synchronization.

18. C — 6x cable diameter is the minimum bend radius for Cat6A. Tighter bends can damage the cable's internal geometry, degrading crosstalk performance and reducing bandwidth capability. Many manufacturers recommend 8–10x for pull-through installations to provide additional margin.

19. B — 3.412 BTU/hr per watt is the standard thermal conversion factor. AV designers use this to calculate cooling loads for equipment rooms: multiply total AV equipment wattage by 3.412 to determine BTU/hr for HVAC coordination. Inadequate cooling is one of the most common causes of premature equipment failure.

20. D — ANSI/AVIXA V202.01 DISCAS addresses image sizing based on viewing distance and viewing task. The standard defines minimum image height calculations for four viewing task categories: Passive, Basic Decision Making, Analytical Decision Making, and Full Motion Video.

21. A — 0.4–0.6 seconds is the typical training room RT60 target. This range provides sufficient acoustic clarity for speech intelligibility while avoiding the sterile feel of an overly-damped room. Longer reverberation times degrade speech comprehension, particularly for non-native language speakers.

22. C — HDCP 2.2 is required for protected 4K UHD content. Every device in the signal chain—source, switcher, distribution amplifier, and display—must support HDCP 2.2 for protected content to pass through. A single non-compliant device in the chain will cause content to blank or downgrade.

23. C — Anti-aliasing filters prevent signal content above the Nyquist frequency from entering the analog-to-digital converter. Without this filtering, frequencies above half the sampling rate would fold back into the audible spectrum as aliasing artifacts. The Nyquist theorem is fundamental to all digital audio and video signal processing.

24. A — 512 channels maximum per Gigabit link at 48 kHz/24-bit is Dante's specified capacity. This substantial channel density enables large-scale audio distribution on standard IT network infrastructure. Higher sample rates reduce maximum channel count proportionally.

25. D — TLS 1.2 is the minimum acceptable version for modern AV security. TLS 1.0 and 1.1 have been formally deprecated due to known cryptographic vulnerabilities. TLS 1.3 is the current recommended standard, but 1.2 remains the minimum compliance threshold.

26. B — Rec. 709 is the color space standard for HDTV 1080p content. It defines the color primaries, white point, and transfer function for high-definition television. Rec. 2020 serves 4K UHD/HDR content, DCI-P3 serves digital cinema, and Rec. 601 serves standard definition.

27. A — 0.4–0.6 seconds is the typical meeting room RT60 target. This range balances speech intelligibility with natural room character for productive conversations. Conference rooms with RT60 above 0.8 seconds typically produce intelligibility complaints from occupants.

28. C — ANSI/AVIXA V201.01 addresses Image System Contrast Ratio. The standard defines four ISCR grades that account for both the display's native contrast and ambient light contribution to the viewed image. Designers use ISCR to verify that ambient conditions don't degrade image quality below the viewing task requirement.

29. D — 5–35 ms is the Haas effect precedence window. Sounds arriving within this range fuse perceptually into a single event, with the first-arriving sound determining apparent localization. This phenomenon is the foundation of delay-fill loudspeaker design in large venues.

30. A — Under 40 ms is the broadcast lip-sync tolerance. Beyond this threshold, the mismatch between audio and video becomes perceivable to viewers. Consumer applications tolerate somewhat higher values (up to 100 ms), but broadcast standards demand tighter alignment.

31. B — ANSI/AVIXA 10:2013 AVSPV provides the performance verification framework. This standard establishes the methodology for systematically verifying installed AV systems against their design specifications. It defines verification item lists, measurement procedures, and pass/fail criteria.

32. D — 40 W minimum amplifier for 10 speakers at 3 W each. The continuous tap load is 30 W (10 × 3 W), and standard practice adds headroom for approximately 33% above continuous load. This prevents amplifier operation at its thermal maximum during sustained use.

33. C — Commercial-grade continuous-duty displays are required for 24/7 operation. These displays are engineered with enhanced thermal management, heavy-duty power supplies, and extended-life backlights specifically for continuous operation. Consumer displays typically fail within 6–12 months of 24/7 use.

34. A — STI 0.75 is the threshold for "good" speech quality per IEC 60268-16. The Speech Transmission Index scale ranges from 0 to 1, with 0.60 being minimum acceptable for public address and 0.45 considered poor. Houses of worship and courtrooms typically specify STI 0.70 or higher.

35. D — 24 A is the maximum continuous load on a 30 A circuit. NEC 80% derating: 30 × 0.80 = 24 A. Exceeding this value on a continuous circuit risks thermal accumulation in conductors and the overcurrent protection device.

36. B — 48 Gbps is HDMI 2.1 maximum bandwidth. This supports 8K@60 Hz or 4K@120 Hz at 4:4:4 10-bit color depth. This bandwidth represents a 2.67× increase over HDMI 2.0's 18 Gbps.

37. A — Under 100 ms is the typical IMAG latency target. Image magnification systems in live venues must maintain lip-sync between the performer on stage and the magnified image on screen. Exceeding 100 ms creates a perceptible disconnect for audience members who can see both the stage and screens.

38. C — Display color temperature misconfiguration is the most likely cause of uniform blue tint. A consistent color cast affecting all content indicates a display-level setting issue rather than source, cable, or HDCP problems. Color temperature recalibration typically resolves this immediately.

39. D — 64 devices per DALI-1 circuit. The Digital Addressable Lighting Interface protocol supports individual control of up to 64 luminaires on a single two-wire bus. DALI-2 expanded this capacity to 128 devices per circuit.

40. B — 2.9 ms per meter is the standard delay conversion at room temperature. Since sound travels at 343 m/s, each meter of distance adds approximately 2.9 ms of propagation delay. This conversion is essential for calculating delay-fill loudspeaker timing in distributed systems.

41. A — Under 0.5 seconds RT60 is the broadcast studio target. Broadcast environments require dry, controlled acoustics to prevent room reverberation from coloring microphone pickup. This allows audio processing to be applied intentionally rather than compensating for uncontrolled room characteristics.

42. C — CRI 90 is the minimum Color Rendering Index for video conferencing rooms. High CRI ensures accurate skin tone reproduction on camera, which is critical for professional video communication. Lower CRI values (70-85) produce unnatural color rendering that degrades video quality.

43. B — APEx 2M-2010 addresses audiovisual design coordination. This AVIXA standard defines the process for coordinating AV design with allied trades including electrical, mechanical, structural, and architectural disciplines. It is not a measurement or verification standard.

44. D — ±1 dB defines ACU High grade. This is the most stringent coverage uniformity requirement, reserved for critical listening environments where minimal SPL variation is essential. Typical applications include studio control rooms and precision monitoring facilities.

45. B — 2 ohms parallel impedance for two 4-ohm speakers. The formula yields 1/Rtotal = 1/4 + 1/4 = 2/4, so Rtotal = 2 ohms. Amplifiers must be specifically rated for 2-ohm loads, as many professional amplifiers have a minimum impedance of 2 ohms.

46. D — 15% power reduction at 100 meters for PoE+. Cable resistance over maximum distance reduces available power at the device. Designers must account for this derating when specifying PoE devices at maximum cable lengths.

47. A — 80–95% efficiency for Class D amplifiers. Switching-topology amplifiers achieve dramatically higher efficiency than linear Class AB designs (50–65%). This reduced heat generation allows smaller form factors and lower cooling requirements in equipment rooms.

48. C — 24 fps is the standard DCI digital cinema frame rate. This matches the historical film projection standard and is the universal mastering format for theatrical distribution. Broadcast and computer applications use other rates (25, 29.97, 30, 60).

49. B — ANSI/AVIXA AVSEM addresses energy management. The standard defines design practices for reducing energy consumption in AV installations, including scheduling-based power management, occupancy sensing, and standby power reduction strategies.

50. D — Years per jurisdictional requirements for courtroom recording retention. Legal recordings must be preserved for appeal processes that can extend 5–10 years or longer depending on jurisdiction. Storage systems must provide archival-grade reliability and tamper-evident integrity throughout the retention period.

51. A — 71 W delivered at device for PoE++ Type 4 (IEEE 802.3bt). This is the highest tier in the PoE standard, enabling powered devices such as video conferencing systems, PTZ cameras, and LED lighting over standard category cable. Source equipment provides approximately 90 W to account for cable loss.

52. C — 0.5–0.8 seconds is the typical hospital clinical RT60 target. Healthcare environments prioritize speech clarity for accurate clinical communication, which directly impacts patient safety. Excessive reverberation degrades speech intelligibility, particularly in emergency situations where rapid verbal communication is critical.

53. D — Electromagnetic emanations security is the purpose of TEMPEST rating. Government classified facilities use TEMPEST-rated equipment to prevent electronic eavesdropping through electromagnetic emissions from AV and computing equipment. This is a federal security requirement, not related to temperature, fire, or acoustic performance.

54. B — 5 meters (approximately 15 feet) is the typical passive HDMI limit at 4K@60 Hz. Beyond this distance, signal integrity degrades below reliable levels due to cable attenuation at high data rates. Active cables, HDBaseT, or fiber extension methods are required for longer runs.

55. A — IGMP snooping prevents multicast flooding to unsubscribed ports. Without IGMP snooping enabled, the network switch treats multicast traffic as broadcast, consuming bandwidth on every port. This is the single most critical switch configuration for AV-over-IP deployments.

56. C — 500 MHz is Cat6A's maximum rated frequency. This supports 10GBASE-T signaling over 100-meter runs. Cat6 supports 250 MHz, and Cat5e supports only 100 MHz.

57. B — DCI-P3 is the standard digital cinema color space. It defines the color gamut for theatrical presentation, providing wider coverage than Rec. 709 (HDTV) while being narrower than Rec. 2020 (UHD/HDR). Cinema projectors and screening rooms must be calibrated to this standard.

58. D — RS-485 is the electrical layer for DMX-512. This differential signaling standard supports multi-drop topologies with cable runs up to 1,200 feet. DMX-512 addresses up to 512 channels per universe using 5-pin XLR connectors.

59. A — NC-45 is typical convention center ambient noise criterion. Large open public spaces with significant HVAC loads and crowd noise typically register at this level. Meeting rooms within convention centers target lower values (NC-30 to NC-35) for adequate speech intelligibility.

60. C — Delta E under 5 is the general corporate display target. This level of color accuracy is sufficient for presentations, video conferencing, and general business content. Color-critical applications such as broadcast reference monitoring require Delta E under 2 or 3.

61. B — Uncompressed PCM audio is carried by SMPTE 2110-30. The standard defines the carriage of professional audio as uncompressed PCM data within the ST 2110 IP network framework. This maintains full audio fidelity without compression artifacts for broadcast production environments.

62. D — 2 weeks is the typical commissioning timeline for a medium AV system. This allows adequate time for systematic verification of all system functions, documentation of test results, remediation of deficiencies, and re-verification. Larger systems may require 4–6 weeks; smaller systems may complete in 1 week.

63. A — 7:1 is the Passive Viewing ISCR per V201.01:2021. This is the lowest contrast requirement, applicable where audiences view content without needing to make decisions from the displayed information. Typical applications include lobby digital signage and background video displays.

64. C — 80:1 is the Full Motion Video ISCR per V201.01:2021. This is the highest contrast requirement in the standard, supporting broadcast-quality motion video where fine detail and color accuracy in moving images are essential. It requires significant ambient light control to achieve.

65. D — 90 degrees phase response at crossover is typical for subwoofer alignment with main speakers. Phase alignment at the crossover frequency ensures smooth energy transition between subwoofer and satellite speakers. Misalignment produces frequency response dips or peaks at the crossover point.

66. B — 0.5 dB is the typical upper limit for speaker cable loss. Beyond this threshold, power dissipation in the cable becomes significant, reducing efficiency and potentially affecting damping factor. Cable gauge and length must be calculated to keep losses below this target.

67. A — 667 W input power. The efficiency formula: output ÷ efficiency = input. 500 W ÷ 0.75 = 667 W. This figure is critical for circuit sizing and cooling load calculations in equipment room design.

68. C — STC 40+ is the typical building partition rating for speech privacy. At this rating, normal conversational speech is barely audible through the partition. Lower STC values (25-35) allow intelligible speech to pass through, compromising confidential meeting room discussions.

69. B — AES67 is the Audio-over-IP interoperability standard. It defines a common transport layer enabling cross-vendor compatibility between different networked audio protocols including Dante, Ravenna, and Livewire+. This prevents vendor lock-in in networked audio deployments.

70. D — Balanced interconnections and proper shielding mitigate ground loops. Balanced audio signals reject common-mode noise by transmitting equal and opposite signals on two conductors. Proper shielding provides an additional barrier against electromagnetic interference coupling into signal paths.

71. A — 0.049 is the Sabine formula RT60 coefficient in imperial units (seconds per cubic foot per sabin). The metric equivalent is 0.161. The formula RT60 = 0.049 × V/A calculates reverberation time from room volume (V) and total absorption (A).

72. C — Zero transition time for online double-conversion UPS. This topology continuously converts AC to DC to AC, so the output is always powered from the inverter regardless of utility status. Standby and line-interactive UPS types require measurable transition times (5–20 ms).

73. B — 12 Gbps per uncompressed 4K@60 Hz stream on SMPTE ST 2110. This substantial bandwidth requirement drives the need for 25 Gbps or higher network infrastructure in ST 2110 facilities. Multiple simultaneous streams require careful network architecture planning.

74. D — 300 meters is typical multimode fiber maximum for 4K AV-over-IP. OM3 and OM4 multimode fiber support this distance at the bandwidths required for 4K video transmission. Singlemode fiber extends capability to tens of kilometers for campus or long-haul applications.

75. A — Punchlist is generated at the substantial completion walk-through. This formal inspection documents all items requiring attention before the project can achieve final acceptance. The punchlist creates a binding record of outstanding work that the integrator must complete.

76. C — Sub-microsecond PTP synchronization is required for ST 2110. IEEE 1588 PTP provides the precision timing infrastructure enabling frame-accurate synchronization of separate audio, video, and ancillary data streams across the production network.

77. B — 700+ nits is the typical daylight-readable commercial display brightness. Standard commercial displays (350-500 nits) and consumer displays (250-350 nits) are inadequate for lobby environments with significant ambient light. High-brightness displays maintain readability in direct sunlight conditions.

78. D — 3000-5000 K is the typical tunable white LED range. This range supports both warm settings (3000 K for hospitality/evening events) and cool settings (4500-5000 K for video conferencing and daylight matching). Tunable white capability eliminates the need for separate warm and cool fixtures.

79. A — Room RT60 determines the appropriate AEC tail length. The echo cancellation algorithm must model the room's reverberation to effectively cancel acoustic echoes. An AEC tail shorter than the room's RT60 allows reverberation to escape processing, producing audible echo for far-end participants.

80. C — Within the 5-35 ms window is the Haas effect precedence requirement. Sound arrivals within this range fuse perceptually with the first-arriving sound. This enables delay-fill loudspeakers to reinforce sound level without audience awareness of the secondary source.

81. D — DICOM-calibrated medical-grade displays are required for hospital operating rooms. DICOM (Digital Imaging and Communications in Medicine) Grayscale Standard Display

Function ensures consistent image rendering for clinical decision-making. Consumer, gaming, and standard commercial displays do not meet medical device regulatory requirements.

82. B — Orange triangle identifies isolated ground receptacles per NEC. These specialty receptacles provide a separate equipment grounding path to reduce electrical noise on AV equipment circuits. They are specified in technical power systems for broadcast, recording, and sensitive AV applications.

83. A — Defective work requiring remediation. Inconsistent display dimming indicates equipment performing below manufacturer specifications. The integrator must diagnose the root cause (power supply, backlight, firmware) and remediate to specification compliance before the item can be closed.

84. C — 512 channels per Gigabit link is Dante's maximum at 48 kHz/24-bit. This channel density enables large-scale audio distribution over standard IT networking infrastructure. The capacity decreases proportionally at higher sample rates (256 channels at 96 kHz).

85. D — Heat-shrink printed labels per AVIXA RP-38-17. This durable labeling method withstands decades of environmental exposure in cable pathways, maintaining readability for future service technicians. Handwritten, adhesive tape, or color-only labels degrade over time and fail the standard's requirements.

86. B — Below 0.45 STI indicates "poor" speech quality. At this level, listeners strain to understand spoken content, making it unsuitable for any speech-reinforcement application. Remediation requires improving coverage uniformity, reducing reverberation, or increasing signal-to-noise ratio.

87. A — 0.864 square inches is the internal area of 1" EMT per NEC Chapter 9 Table 4. This value determines how many cables of each diameter can be installed within the conduit at the applicable fill percentage. Accurate area calculations prevent over-filled conduits that create pulling damage and heat buildup.

88. D — 700+ nits is the minimum brightness for daylight-readable lobby displays. Ambient light in lobby environments typically produces significant screen wash, requiring high-brightness panels to maintain visible contrast. Standard brightness displays appear washed out and unreadable in these conditions.

89. C — 3-pin XLR connector is the standard for AES3 balanced digital audio. This professional-grade connector provides secure, locking connections suitable for the differential signaling used in AES/EBU digital audio transmission. BNC is used for AES3-id coaxial variant.

90. A — 10x cable diameter is the typical fiber optic minimum bend radius. Fiber is more sensitive to bending than copper cables because excessive curvature causes micro-bending losses and potential fiber breakage. Conservative bend radius preserves optical performance and cable longevity.

91. D — Below 1 dB cable loss is the standard for speaker line power dissipation. This ensures that the vast majority of amplifier power reaches the loudspeaker rather than being dissipated as heat in the cable. Cable gauge and length must be calculated to achieve this target for each specific circuit.

92. B — 500 MHz is Cat6A's maximum rated frequency. This bandwidth supports 10GBASE-T transmission at 10 Gbps over the full 100-meter distance. Higher-frequency capability enables Cat6A to support demanding AV applications including HDBaseT and AV-over-IP.

93. A — HDMI 2.1 support is required for eARC (Enhanced Audio Return Channel). eARC provides uncompressed multi-channel audio return from display to soundbar or AVR, supporting formats including Dolby TrueHD and DTS-HD Master Audio. Standard ARC on HDMI 2.0 supports only compressed audio.

94. C — STI 0.70+ is the typical sanctuary speech reinforcement target. Houses of worship require high intelligibility for spoken liturgy, sermons, and readings. Achieving this target requires coordinated coverage uniformity, appropriate acoustic treatment, and adequate signal-to-noise ratio.

95. D — 10 Gbps approximate bandwidth for 4K@60 Hz 4:2:0 10-bit uncompressed video. The calculation: 3840 × 2160 × 60 frames × 10 bits × 1.5 (for 4:2:0 subsampling) ≈ 7.5 Gbps raw data, approximately 10 Gbps with transport overhead. This drives the minimum network infrastructure requirement for uncompressed 4K transport.

96. B — UL-listed firestop assembly is required for rated penetrations. NFPA and NEC mandate that any penetration through a fire-rated wall, floor, or ceiling must be sealed with a UL-listed firestop system that maintains the original fire rating. Generic caulking, paint, or foam do not meet code requirements.

97. A — 1-2% voltage drop is typical over 100 ft of 12 AWG at moderate loads. NEC recommends maximum 3% voltage drop for branch circuits and 5% total from service to load. Excessive voltage drop reduces equipment performance and may cause operational issues.

98. C — Under 150 ms is the typical video conferencing latency target. This threshold preserves natural conversational flow between remote participants. Higher latency produces perceivable delay that disrupts turn-taking and creates conversational overlap.

99. B — Cardioid polar pattern is typical for conference table microphones. The cardioid pickup pattern provides front-facing sensitivity with rear rejection, capturing the speaker while rejecting sound from loudspeakers and adjacent participants. This directionality improves gain-before-feedback and reduces background noise pickup.

100. D — 500 Mbps to 1 Gbps is the typical compressed 4K AV-over-IP stream bandwidth. Visually lossless compression algorithms (JPEG 2000, TICO, NDI) reduce the 12+ Gbps uncompressed

bandwidth to fit within Gigabit network infrastructure. This enables practical 4K distribution on standard enterprise networking.

101. A — Calibration reference is the primary purpose of SMPTE color bars. The standardized test pattern provides known color and luminance values that enable consistent display calibration across multiple monitors and facilities. This ensures that content appears as intended throughout the production and distribution chain.

102. C — PTP (Precision Time Protocol) is the common name for IEEE 1588. This protocol provides sub-microsecond network synchronization essential for SMPTE ST 2110, AES67, and other professional media protocols. It operates independently of NTP and provides orders-of-magnitude better accuracy.

103. B — 30+ minutes UPS runtime is typical for broadcast master control. This duration allows ride-through of brief utility interruptions and provides adequate time for generator startup during extended outages. Broadcast facilities cannot tolerate any interruption to on-air operations.

104. D — 1.5–2 mm pixel pitch for 5-meter viewing distance on direct-view LED. The rule of thumb (pixel pitch in mm × 3,000 = minimum viewing distance in mm) yields: 1.5 mm × 3,000 = 4.5 m and 2 mm × 3,000 = 6 m. This ensures pixel-free image quality at the specified viewing distance.

105. A — 0.90+ power factor is achieved by modern AV equipment with power factor correction. Active PFC circuits in modern switching power supplies achieve near-unity power factor, reducing reactive power and current draw. Legacy equipment without PFC typically operates at 0.60-0.75 power factor.

106. C — Encrypted signal transport with isolated AV network is the typical corporate boardroom security requirement. Board meetings involve confidential strategic, financial, and legal discussions requiring protection from eavesdropping and unauthorized access. Consumer, standard office, or cloud-based approaches don't meet this confidentiality requirement.

107. B — Under 500 ms touch panel response provides good user experience. Faster response times create the perception of immediate system reaction to user input. Response times exceeding 1-2 seconds produce user frustration and repeat-pressing behavior that can cause system confusion.

108. D — 6+ mm pixel pitch is appropriate for 30-meter stadium viewing. Applying the viewing distance rule: 6 mm × 3,000 = 18 m minimum, which provides comfortable pixel-free viewing well within the 30-meter range. Finer pitch would be wasted at this viewing distance and significantly increases cost.

109. A — 90 degrees field of view is appropriate for a 25-foot wide conference room. This provides adequate coverage of all participants from a front-wall camera position. Narrower fields miss peripheral seating, while wider fields may produce unnatural distortion.

110. C — 80–95% is the typical Class D amplifier efficiency range. Switching amplifier topology delivers dramatically less heat than Class AB designs (50–65% efficient), enabling higher power density in smaller form factors. This efficiency advantage reduces cooling requirements and operating costs in large-scale installations.