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Audio Fundamentals for Recording Final Exam

PART I – True / False - (worth 2 points each) 20 points total

1.) Sampling rate and bit depth are independent and can be used in different combinations.
    TRUE
    FALSE

2.) The amplitude resolution of a digital system is determined by its bit depth.
    TRUE
    FALSE

3.) 0 dBFS = 0 VU in most cases.
    TRUE
    FALSE

4.) An AES/EBU cable is identical to a microphone cable.
    TRUE
    FALSE

5.) ADAT digital transmission format can also carry embedded word clock.
    TRUE
    FALSE

6.) Word clock is used for digital console automation.
    TRUE
    FALSE

7.) Digital equipment can be slaved from an external word clock source without using a dedicated word clock BNC connector and cable.
    TRUE
    FALSE

8.) When connecting an analog source signal to the analog input of a digital recorder, the user can select either the recorder's internal A/D converters, or external ones.
    TRUE
    FALSE

9.) The MADI digital transmission format can employ either optical cables or coaxial cables.
    TRUE
    FALSE

10.) The number of separate audio channels carried by a single MADI connection depends on the sampling frequency.
    TRUE
    FALSE

PART 2 – Multiple Choice - (worth 2 points each) 20 Points Total

1. **The frequency response of a digital audio converter is related to**
   a. Bit depth
   b. The digital transmission format used
   c. Sampling Frequency
   d. all of the above
   e. None of the above

2. **In digital audio, bit resolution refers to**
   a. The dynamic range of the digital audio system.
   b. the number of 0's and 1's used to represent each amplitude measurement.
   c. the amplitude resolution of a digital audio system.
   d. all of the above.
   e. none of the above.

3. **In digital audio, each sample captures**
   a. the highest frequency of the audio
   b. the speed of the master clock
   c. the amplitude of the audio
   d. the quantization error
   e. none of the above

4. **An 8-bit system has how many discrete values?**
   a. 4096
   b. 8
   c. 1024
   d. 256
   e. 65,536

5. **To digitally encode the highest frequency in a signal successfully, it must be sampled at a rate at least _____ that frequency.**
   a. equal to
   b. twice
   c. three times
   d. four times
   e. none of the above

6. **When sending digital audio signals from one device to another**
    a. both devices must be locked to the same speed reference.
    b. clocking from the same speed reference will give the best quality audio, but it's not critical.
    c. a common speed reference is never required in this situation.
    d. it's best to first convert the digital audio into analog audio, since analog always sounds better than digital.
    e. none of the above.

7. **A balanced audio connection**
    a. uses three independent conductors
    b. uses the shield as both return (-) and ground
    c. helps to minimize noise and interference
    d. a and c
    e. b and c

8. **On a digital audio meter, 0dBFS indicates**
    a. the nominal operating amplitude of a digital audio system.
    b. the minimum possible amplitude of a digital audio system.
    c. the maximum possible amplitude of a digital audio system.
    d. A and C only.
    e. B and C only.

9. **In terms of disk space, a 16-track digital audio recording made at 44.1kHz/24-bit will take up**
    a. 5 MB/minute.
    b. 80 MB/minute.
    c. 160 MB minute.
    d. 60 MB/minute.
    e. 120 MB/minute.

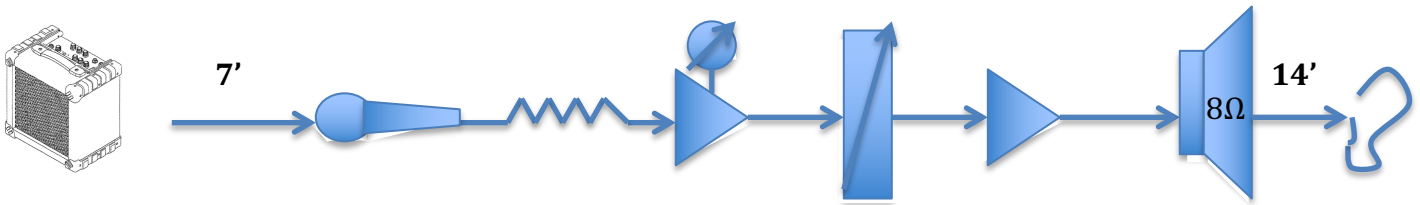10. **In order to feed a number of source signals to a single destination, one must use**
    a. an insert.
    b. a send.
    c. a bus.
    d. a or c.
    e. b or c.

Part 3 - Short Answer - (worth 5 points each) 40 Points Total

1. What is quantization error and how can it be minimized?

2. What is aliasing and how can it be minimized?

3. Why is a master clock often necessary in a multiple-device digital studio?

4. What is latency and why does it occur. How can we work around it when recording?

5. In digital audio, what is the Nyquist theory?

6. How does a DI work, and what is it used for?

7. Describe the difference between serial and parallel processing.

8. Explain the difference between a digital console and a controller.

Part 4 - Gain structure - 20 Points Total

Calculate and fill in the values for the following gain structure:

7'

14'

8Ω

100 dB SPL
@ 4 feet

Mic sensitivity:
1 Pa yields -46 dBV

Mic Pad
-10 dB

Mic preamp:
+ 58 dB

Rec. level:
-2 dB

Power Amp:
+4 dBu yields
100 W into 4Ω

Speaker Sensitivity:
1W yields 88 dB SPL
@ 4'

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