Gabriel Emerson | gte0002 | HW1 Due: 1/20

1.) 5 channels
Sample rate 44.1 KHz
16 bits/sample
2 hour movie

$44.1 \cdot 1000 \cdot 16 \cdot 5$
$= 3,528,000$ bits/s

$3528,000 \frac{bits}{s} \cdot 120 \cdot 60s \cdot \frac{1 byte}{8 bits}$

$\cdot \frac{1 \text{ Binary GB}}{2^{30}} = \boxed{2.95714 \text{ binary GB}}$

2.) Decimal size 2TB

$2 \text{ Decimal TB} \cdot \frac{1000 GB}{1 TB} = \boxed{2,000 \text{ Decimal GB}}$

$2 \cancel{\text{Decimal TB}} \cdot \frac{10^{12} \cancel{byte}}{1 TB} \cdot \frac{1 GB}{2^{30} \cancel{byte}} = \boxed{1862.65 \text{ Binary GB}}$

3.) 10 Binary GB in 1 second.

$10 \cancel{\text{Binary GB}} \cdot \frac{2^{30} \cancel{byte}}{1 \cancel{\text{Binary GB}}} \frac{1 \text{ decimal GB}}{10^9 \cancel{byte}} = \underline{10.7374 \text{ dec GB}}$

$= 85.8993 \text{ dec Gb}$

$\frac{85.8993 Gb}{1s} \Rightarrow \boxed{85.8993 \text{ Gbps}}$

4.) 1.10 in textbook

a.) digital
b.) digital
c.) analog
d.) analog
e.) digital
f.) analog
g.) analog
h.) digital
i.) analog
j.) digital
k.) analog.

5.) 1.15 in textbook

$2^{11} = 2048 > 2000$

11 bits

$2^{20} = 1048576$

20 bits

can display all 6 digit values.

6.) $n = 12$ $V_{FS} = 15V$

a.) $V_{out} = ?$ $V_{in} = 4.82V$

$V_{LSB} = \frac{15}{2^{12}} = 3.662 \times 10^{-3}$

$\frac{V_{in}}{V_{LSB}} \Rightarrow \frac{4.82}{3.662 \times 10^{-3}}$

$= 1316.18$

≈ 1316

$1316 \cdot 3.662 \times 10^{-3}$ **$= 4.8193\ V_{out}$**

b.) Lower band: $V_{out} - \frac{V_{LSB}}{2}$ $4.8193 - \frac{3.662 \times 10^{-3}}{2}$

$\Rightarrow 4.8175$

Upper band: $V_{out} + \frac{V_{LSB}}{2}$ $4.8193 + \frac{3.662 \times 10^{-3}}{2}$

$\Rightarrow 4.82117$

Range $= 4.8175V < V_{in} < 4.82117V$

c.) $SNR = 6.02 \cdot n + 1.76dB$ $n = 12$

$\Rightarrow 74.0dB$

7.) 1 exabyte $= 2^{60}$ byte $2^{64} = 2^4 \cdot 2^{60}$ 1 exabyte

$= 16$ exabytes

8.) $2 \cdot 20$ million $= 40$ million

$40{,}000{,}000$ bin ~~TB~~ $\cdot \frac{2^{40}\ \text{~~byte~~}}{1\ \text{~~TB~~}} \cdot \frac{1\ EB}{2^{60}\ \text{~~byte~~}}$

$\Rightarrow 38.147$ bin EB