8124

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ELEC-2210 Intro HW

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(found bits/sec 1st) ← Transmition Rate

1. $44.1\ KHz \cdot \frac{10^3\ Hz}{1\ KHz} \cdot 5\ channel \cdot \frac{16\ bit}{sec} = \boxed{3.528 \times 10^6\ bits/sec}$

Two hour movie

$2\ hr \cdot \frac{60\ min}{hr} \cdot \frac{60\ sec}{1\ min} = \boxed{7.2 \times 10^3\ sec}$

$\cdot\ 3.528 \times 10^6 \cdot 7.2 \times 10^3 \cdot \frac{1\ byte}{8\ bits} \cdot \frac{Dec\ GB}{10^9\ bytes} = \boxed{3.1752\ Dec\ GB}$

*Binary $3.1752 \approx 3_{10} = \boxed{11_2\ GB\ (Binary)}$

2. *2TB HD to Dec + Bin GB

$2\ TB \cdot \frac{10^{12}\ bytes}{1\ TB} \cdot \frac{1\ GB}{10^9\ bytes} = \boxed{2000\ GB\ Dec}$

Decimal

$2\ TB \cdot 1024 = \boxed{2048\ Bin\ GB}$

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3 Internet speed in GB/sec to download 5GB in 2 sec

$$5\,GB \cdot \frac{1\,sec}{2\,GB} = \boxed{2.5\ GB/sec}$$

4 Classify as analog or Digital

a) Status of light switch — digital
b) Status of thermostat — digital
c) water pressure — analog
d) gas tank level — analog
e) Bank overdraft Status — digital
f) light Bulb intensity — analog
g) Stero volume — analog
h) full or empty cup — digital
i) room temperature — analog
j) TV channel selection — digital
k) tire pressure — analog

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5 a) Digital multimeter 0 to 2000 How any bits

$2^n \geq 2048$

$2^{11} \geq 2048$

So **11 bits** are needed

b) for 6 bits ⇒ 0 to 999999

So, $2^n \geq 10^6$

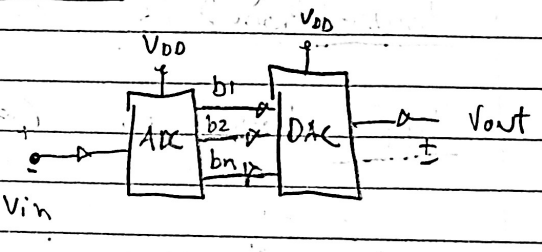
$2^{20} \geq 10^6$

min number of **bits is 20**

6 a)

- Vin = 3.81 V
- n = 12

$V_{FS} = 15\ V$



$V_{LSB} = \frac{V_{FS}}{2^n} = \frac{15\ V}{2^{12}} = 3.6621 \times 10^{-3} = V_{LSB}$

- Binary code ⇒ $\frac{V_{in}}{V_{LSB}} = \frac{3.81}{\left(\frac{15}{2^{12}}\right)} = 1040.384 = \text{Dec} = \text{Bin} = 1000001000_2$

V_{out} = Binary code Dec Eq $\cdot \frac{V_{FS}}{2^n}$

- $V_{out} = 1040 \cdot \frac{15\ V}{2^{12}} = 3.80859375\ V_{out}$

Find Range

6 b) range of V_{in} that give same V_{out} of $V_{in} = 3.81\ V$ but $V_{in} > V_{out}$

$$V_{LSB} = \frac{V_{FS}}{2^n} = \frac{15}{2^{12}} = 3.66\ mV$$

Bin Code

$[100000\ 10000]_2 \cdot V_{LSB} =$ **3.80859375 V Center**

lower Bound is Center $- 0.5 \cdot V_{LSB} =$ **3.806762695 V**

Upper Bound is Center $+ 0.5 \cdot V_{LSB} =$ **3.810424805 V**

C $SNR = 6.02 \cdot n + 1.76dB$

$SNR = 6.02 \cdot 12 + 1.76dB =$ **74 dB SNR**

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7 $1\ EB = 2^{60}$ bytes

64 bit $= 2^{64}$ diff bytes

$= 2^{60} \cdot 2^4$ bytes

$2^4 \cdot (1EB) =$ **16 EB**

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Auton Smart Car = * 5 binary TB Daily

Data Per day $= 5 \cdot 2^{40}$ bytes

* $1\ TB = 2^{40}$ bytes

* $1\ EB = 2^{60}$ bytes

$\Rightarrow$ (20 million cars) $\cdot$ (5TB) $= 20 \cdot 10^6 \cdot 5 \cdot 2^{40}$ bytes

$\rightarrow = 2^8 \cdot 2^{40}$ bytes

So, $10^8 \cdot 2^{40} \cdot \frac{1EB}{2^{60}\ byte} =$ **95.36743164 EB**