

Thursday Reading Assessment: Chapter 1

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1 Memory Bank

1. Combining resistors *in series*: $R_{\text{tot}} = R_1 + R_2$
2. Combining resistors *in parallel*: $R_{\text{tot}}^{-1} = R_1^{-1} + R_2^{-1}$

2 Digital and Analog Concepts, Unit Conversions

1. Perform the following unit conversions:
 - Convert 0.24 V to mV.
 - Convert 0.035 A to mA.
 - If two 1200 Ω resistors are connected *in series*, what is the total resistance in k Ω ?
 - If two 1200 Ω resistors are connected *in parallel*, what is the total resistance in k Ω ?
 - If a digital pulse has a *rise time* of 0.01 μs , what is the rise time in ns?
 - If a system can send a digital pulse with a minimum *pulse width* of 300 ns, how many pulses per second can it send? That is, what is the maximum pulse rate?
2. Suppose a system is passing an analog voltage signal down a wire, with *amplitude* a , and *frequency* f_1 :

$$v(t) = a \cos(2\pi f_1 t) + v_0 \tag{1}$$

(a) **Digitizing** the signal means breaking the amplitude variable into discrete components. If we can measure 256 discrete voltages between 0 and 5V, and $a = 2.5$ V, $v_0 = 2.5$ V, what is the smallest change in voltage we can measure? (b) **Sampling** the signal means breaking the time variable into discrete components. Suppose $f_1 = 60$ Hz. This means the *period* is 1/60 seconds. If we sample $v(t)$ at a rate of 1 kHz, how many samples per period will we collect?