Week 2 Prelab

Calculate the ratio RMS/Vpp for the following signals. Show all your work!

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1. Square Wave: RMS / Vpp = ?

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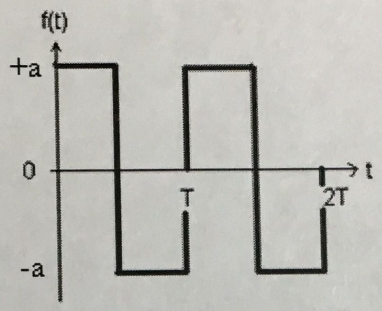
$V_{pp} = a - (-a) = 2a$

$f^2(t) = a^2$



$RMS = \sqrt{\frac{1}{T}\int_0^T a^2\,dt}$

$= \sqrt{\frac{a^2}{T}T}$

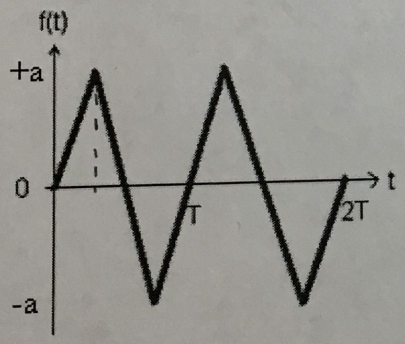
$= \sqrt{a^2} = a$

$\frac{RMS}{V_{pp}} = \frac{a}{2a} = \boxed{\frac{1}{2}}$

2. Triangular Wave: RMS / Vpp = ?

$V_{pp} = 2a$

$f(t) = \frac{a}{t_1} \cdot t$



$RMS = \sqrt{\frac{1}{T}\int_0^{t_1} \frac{a^2 t^2}{t_1^2}\,dt}$

$= \sqrt{\frac{a^2}{T t_1^2} \cdot \frac{1}{3}t^3 \Big|_0^{t_1}}$

$= \sqrt{\frac{a^2 t_1}{3T}}$ $\quad T = t_1 \Rightarrow \sqrt{\frac{a^2}{3}}$

$\frac{RMS}{V_{pp}} = \frac{a}{\sqrt{3}} \cdot \frac{1}{2a} = \boxed{\frac{1}{2\sqrt{3}}}$

3. If you see a difference by a factor of 10 between the oscilloscope reading and the function generator setting, where is the first place that you should look? Watch the Probe Setting video (https://youtu.be/dtSuTHIviSo) for the answer.

The channels will indicate the attenuation of the probe. Hence, we look at the channels and set them to the proper attenuation.

4. If you see a difference by a factor of 2 between the oscilloscope reading and the function generator setting, where is the first place that you should look? Watch the Function Generator Output Impedance video (https://youtu.be/-8Dv1oOjD9w) for the answer.

I should look towards the utilities to properly match the load impedance between the function generator and the oscilloscope.

In particular, the output impedance of the function generator should match the input impedance of the oscilloscope.

5. Why would you ever want to use AC coupling on an oscilloscope? Watch the AC Coupling video (See CCLE) for the answer.

AC Coupling blocks the DC level of the output and increases the sensitivity of the signal. AC Coupling allows us to see the real structure of the waveform.

Week 2 Prelab End