EE 205 Circuit Theory

Lab 9

Steady State Sinusoidal Response (Phasor Analysis)

Procedure:

Consider the RC circuit shown in Fig.1 with C=1uF, R=10. Use a cos source signal with 10V peak and 0V offset at 100kHz frequency. We aim to find the steady state $V_C(t)$.
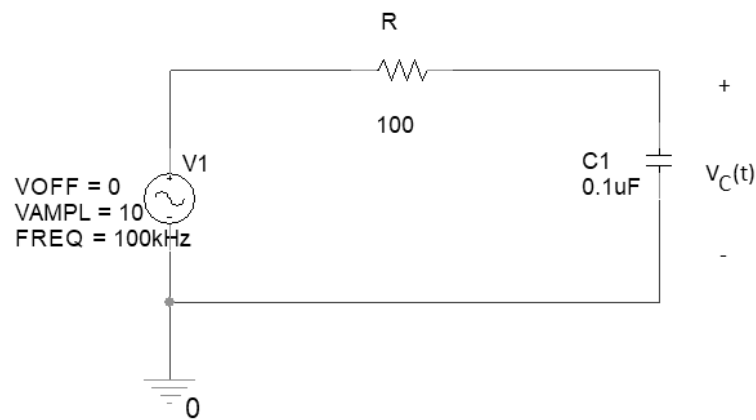

Fig.1. Steady State RC Circuit

The phasor impedance of the capacitor is

$$Z_C = \frac{1}{j\omega C} = \frac{-j}{2\pi(10^5)(10^{-7})} = \frac{-j100}{2\pi} \cong -j16 \,\Omega$$

Thus, the capacitor voltage phasor is

$$\bar{V}_C = 10 \times \frac{-j16}{100 - j16} \cong 0.25 - 1.6j \cong 1.58\angle - 1.4158 \cong 1.58\angle - 81^0$$

The time expression of the capacitor voltage is

$$V_C(t) = Re\{\bar{V}_C e^{j\omega t}\} = 1.58\cos(\omega t - 81^0)$$

Table 1. Calculated and Measured Values

Calculated Values for V_C		Measured Values for V_C	
Amplitude (V)	*Phase* (degrees)	*Amplitude* (V)	*Phase* (degrees)