Good essay about lab 9: ac analysis in multisim

Business, Company

Part 1 Analyzing a Simple RC Circuit

1-2. A snapshot of the circuit built in Multisim is shown in the following figure:

3-6. The function generator's output is set to the following: sine wave, frequency of 1 kHz, and amplitude VPK = 5 volts. Then, an oscilloscope is added to measure the input and the output voltages. The circuit in Multisim is shown in the following circuit diagram:

Upon running the simulation and adjusting the oscilloscope settings, the following output waveform is displayed in the oscilloscope interface:

7-11. The oscilloscope cursors are adjusted such that the time difference between the two traces are measured. This is done by setting the first cursor to the maximum of the first waveform, and then setting the second cursor to the maximum of the second waveform. The locations of the cursors are such that they are on adjacent maxima of the two waveforms. A snapshot of the oscilloscope with the positioned cursors is shown in the following image:

12. The time difference Δt = 50 μs. Thus, the phase difference between the two waveforms is:

$$\theta = \Delta t \times f \times 360° = 50 \times 10\text{-}6 \times 1000\text{Hz} 360° = 18°$$

13-17. A current probe is added in the circuit to measure the current running through the capacitor. The current probe is added and set in the circuit as shown in the following snapshot:

The output of the oscilloscope is shown here:

The blue trace is the current; the red trace is the voltage. This waveform output shows that the capacitor current leads the capacitor voltage by a phase difference of 90o.

18-19. Using the Grapher function, the oscilloscope output is viewed in graphical form. The current waveform shown from the oscilloscope is displayed in the following graph:

20. The function generator output is changed as follows: square wave, 100 Hz, 0. 5 Vpk, 0. 5 V DC offset. The following snapshot shows the circuit and the oscilloscope output:

21. The Grapher function is again used; the snapshot of the Grapher view is shown here:

22-23. At this point, the oscilloscope is replaced by the Tektronix oscilloscope. The simulation is run, and the controls are set such that a decent output is shown. The following is a snapshot of the circuit and the Tektronix oscilloscope:

24. The time/div is adjusted to 1 ms/div. It is estimated that the time constant of the waveform is:

τ= 1 ms

Part 2 Performing More Complex AC Analysis

1. The snapshot of the circuit constructed in Multisim is:

2-6. AC analysis is set up in Multisim. The frequency parameters are as follows:

Then, the output of the AC analysis is set up; the outputs include the voltage across the capacitor, and the current across the capacitor. These two are

represented by V(1)-V(2) and V(3), respectively. The following image is a snapshot of the setting up of the analysis outputs:

7. The simulation is run. Multisim generates graphs of the two outputs; a snapshot of these graphs is shown in the following (red = capacitor voltage, green= capacitor current):