CND 101 - LAB [5]

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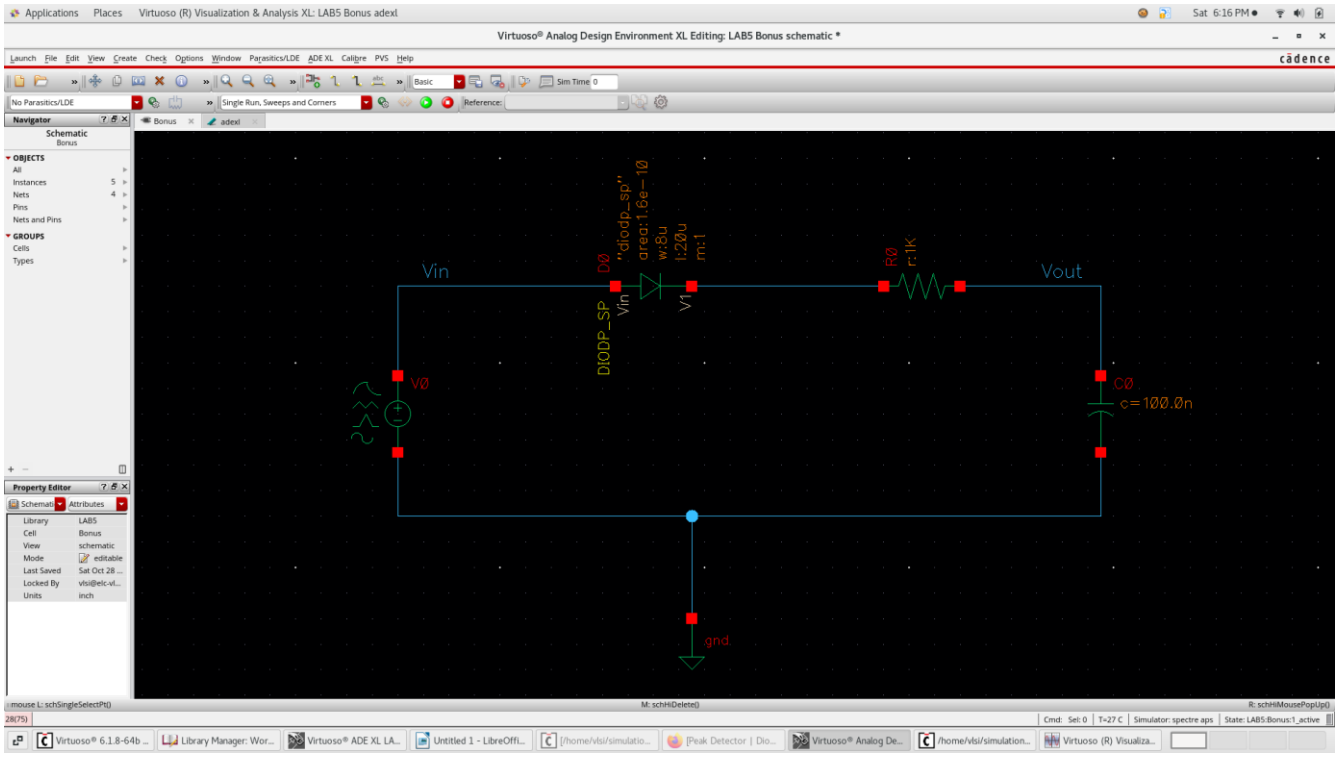
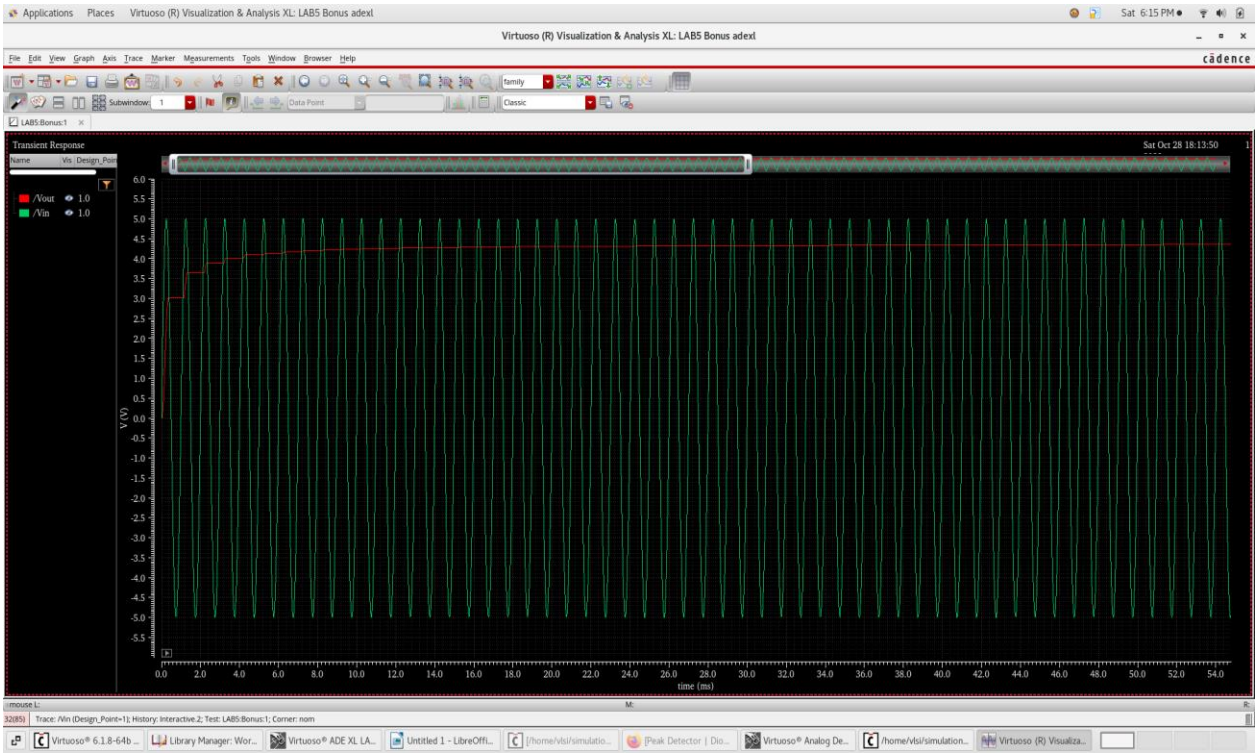
Bonus Questions of Lab 5



- **Transient analysis**



Comments

Here are the most important comments about this circuit:

- Peak Detection: The primary function of this circuit is to detect and capture the peak (maximum) value of the input AC signal. It is commonly used in applications where tracking the peak amplitude of an AC waveform is necessary.
- Half-Wave Rectification: This circuit employs a diode as a half-wave rectifier, allowing only the positive half of the AC signal to pass through. The diode conducts during the positive half-cycle and blocks during the negative half-cycle.
- Filter Capacitor: A capacitor is connected in parallel with the diode in the circuit. The capacitor charges to the peak voltage of the positive half-cycle and stores this voltage.
- Discharge Time Constant: The rate at which the capacitor discharges is determined by the discharge time constant, which depends on the resistance in parallel with the capacitor. A higher resistance results in a slower discharge rate.
- Hold and Sample: The capacitor effectively holds and samples the peak value, even as the input AC signal varies. It releases the stored voltage when needed, offering a constant voltage proportional to the peak amplitude.
- Output Voltage: The output voltage of the peak detector is approximately equal to the peak value of the input AC signal. It is less affected by variations in the input signal when compared to the original AC waveform.
- Time Constant Considerations: The time constant of the circuit (determined by the resistance and capacitance values) affects the response time of the peak detector. Smaller time constants result in faster response but may also lead to more sensitivity to signal variations.
- Applications: Peak detectors are widely used in applications such as audio level indicators, voltage regulation, amplitude measurement, and peak-hold functions in oscilloscopes.
- Advantages: This circuit is simple and cost-effective, making it suitable for basic peak detection needs. It can be integrated into various electronic systems with ease.
- Limitations: The main limitation of this circuit is that it only captures the positive peaks of the AC signal. Negative peaks are not detected. For full-wave peak detection, a full-wave rectifier and a different capacitor arrangement are required.