

# CIE 337 Project I Report (Part II)

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## Part II: Generation of a Frequency-modulated Signal Using Simulink® for Sawtooth and Sinusoidal Message Signals

### Generation of a Frequency-modulated for a Sawtooth Message Signal

Based on the information stated in Part A's report introduction, one chooses the needed blocks, accordingly. The fundamental fixed-step size of the simulation solver is 0.0001. The following list exhibits the blocks needed with the change done to their parameters to meet the requirement:

- A simin block for loading the message signal from MATLAB workspace.
- A Gain block, whose parameter is set to have the value of  $2\pi K_f$ ,  $2000\pi$ , and its input is the message signal.
- A constant block, whose parameter is set to have the value of  $\omega_c$ ,  $20000\pi$ .
- Summation block, whose inputs are the  $\omega_c$  and the amplified message signal.
- An integrator block, whose input is the amplified message signal.
- Trigonometric function block that represents a cos carrier signal, whose input is the integrator's output.
- A two-input scope to view the message signal and the modulated signal.

The layout of the frequency modulator is shown in **Figure 1**.

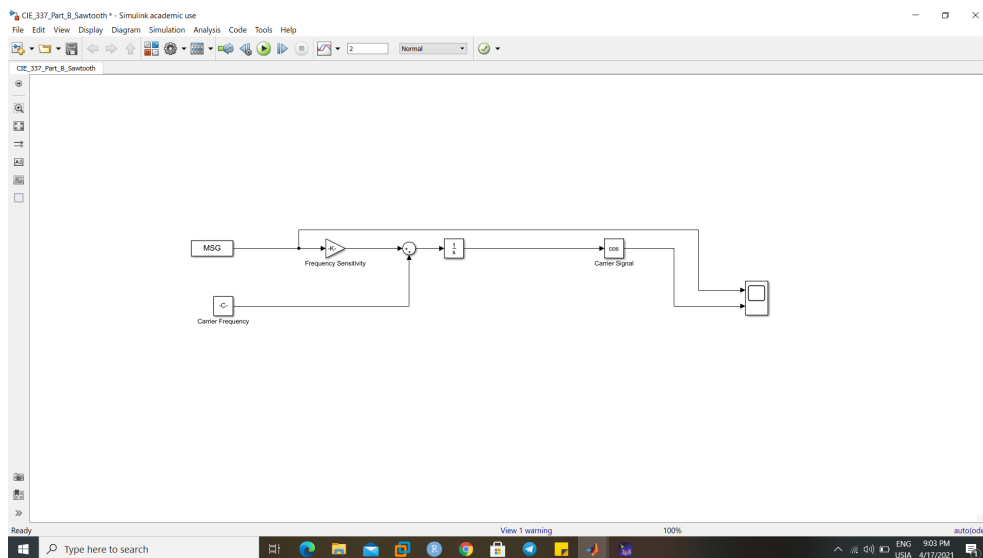


Figure 1: The Layout of the Frequency Modulator

When one runs the simulation, the scope views the results that are shown in **Figure 2**, where the above graph represents the message signal and the other is the modulated signal.

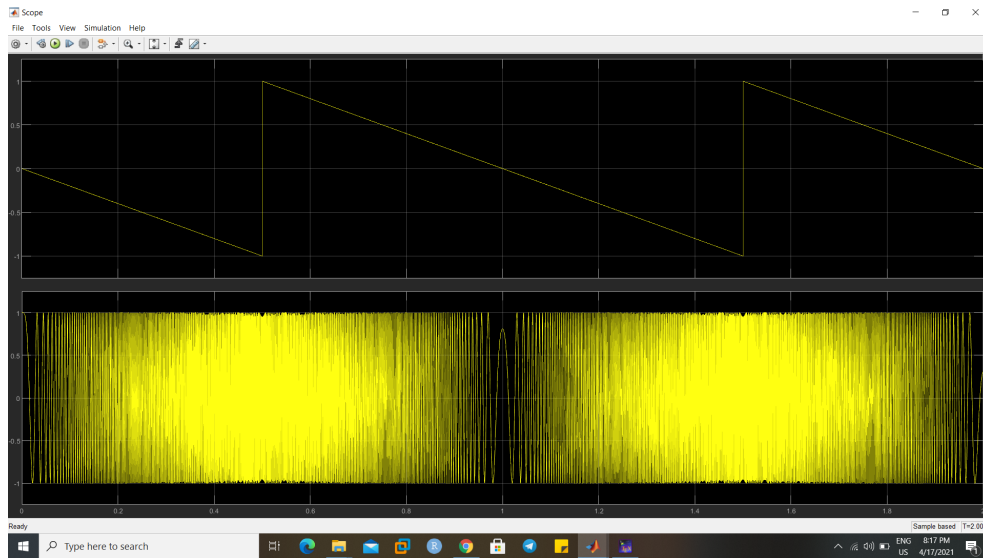


Figure 2: Simulink Scope View

### Generation of a Frequency-modulated for a Sine Message Signal

The blocks used to generate the FM signal in this part are the same blocks mentioned in the previous subsection, except that the `simin` block is replaced with wave generator, whose wave form definition is set to `"sin('Amplitude', 1.5, 'Frequency', 2*pi*2000, 'Phase', 0)"`, and the sample time parameter is changed to 0.000001, and the  $K_f = 3000$ , in addition to the fundamental fixed-step size of the solver being changed to 0.000001. The layout of the frequency modulator is shown in **Figure 3**.

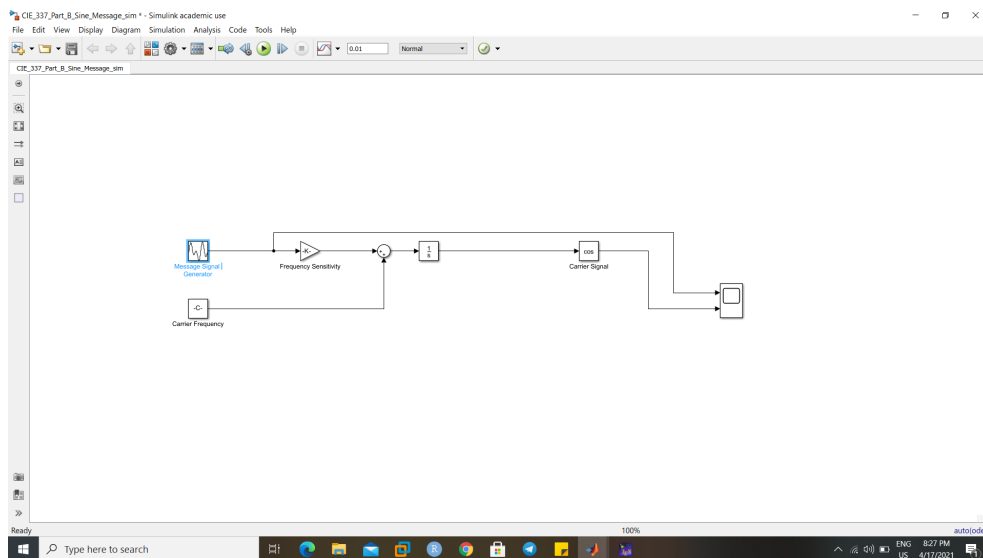


Figure 3: The Layout of the Frequency Modulator

When running the simulation, the results comes as shown in **Figure 4**.

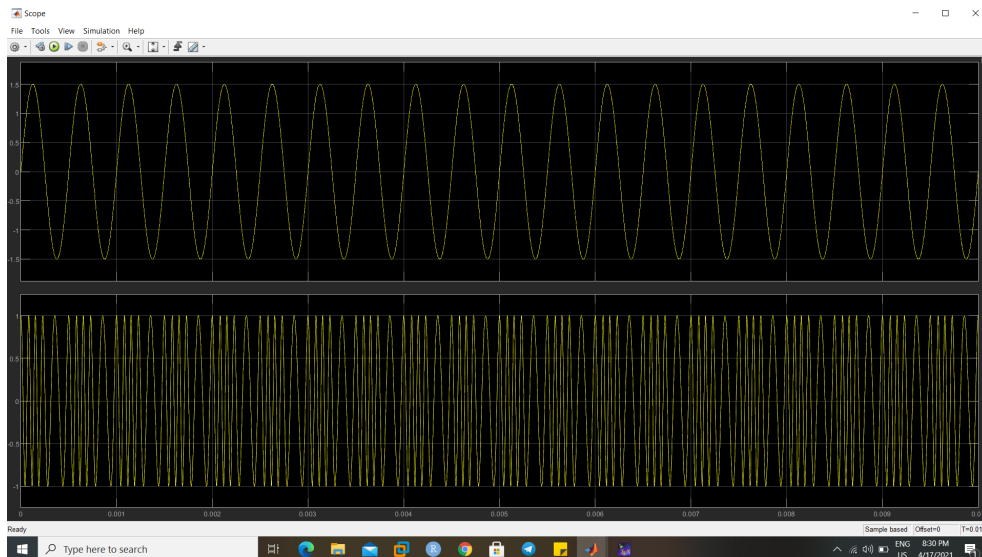


Figure 4: Simulink Scope View