Frequency Modulation - Preparation

- **Name:**   **Lab Date:**

- **Student No.:**   **Day of the week:**   **Time:**

1. *Write an equation for an FM-modulated signal, and explain the significance of all elements in the equation.*

2. *Explain Carson's Rule and how it is expressed for the wide-band and narrow-band cases. Why is there a difference?*

3. *Based on the FM equation you wrote on 1, draw a* `Simulink`*-style block diagram to implement an FM modulator. Use the direct method (you're looking for a Voltage-Controlled Oscillator).*
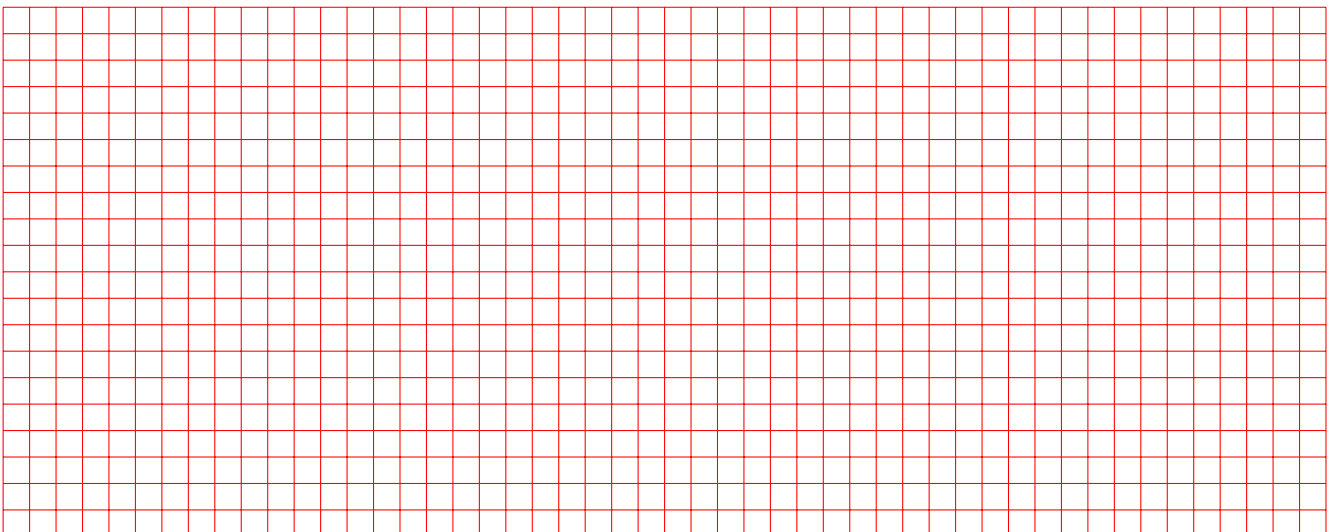
4. *Sketch the FM modulated signal (assume a sinusoidal signal modulating a sinusoidal carrier) in both time and frequency domain. How will the bandwidth be limited in the frequency domain? What is the spacing between the frequencies represented in the frequency domain? Is there any instance in which the carrier frequency will not appear in your frequency domain plot? (Refer to the Lathi reference, pp.114 and 115)*
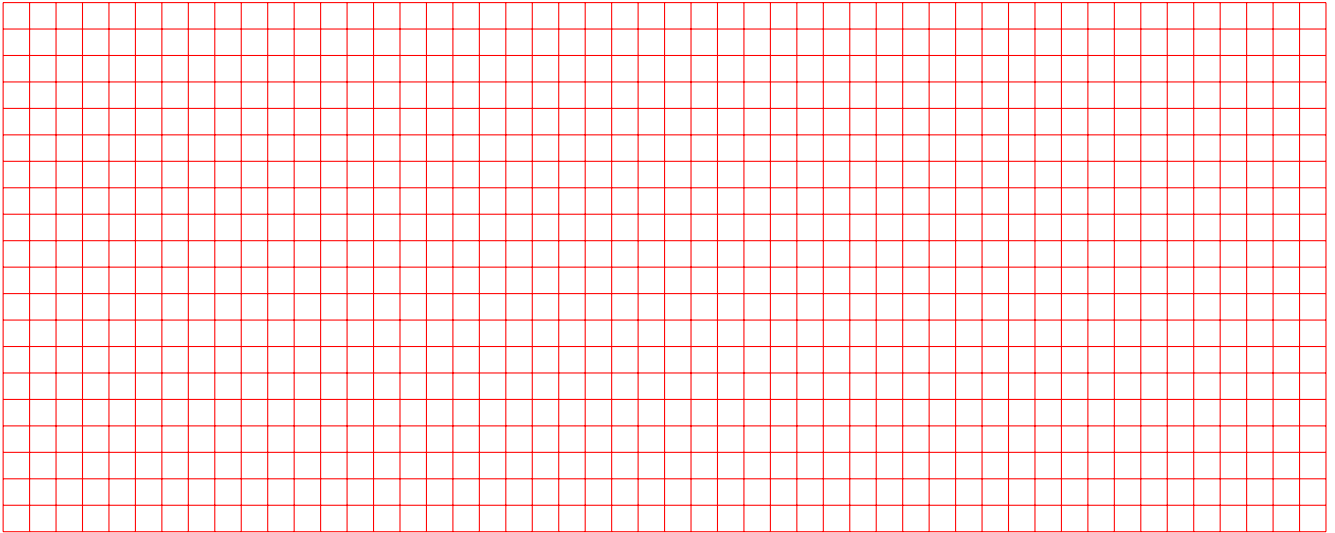
5. *Draw a* `Simulink` *block diagram for an FM demodulator based on a Phase-locked loop (PLL). You can find a simplified figure on pg. 178 of the Simon Haykin reference. Explain the principle behind the demodulation with a PLL.*