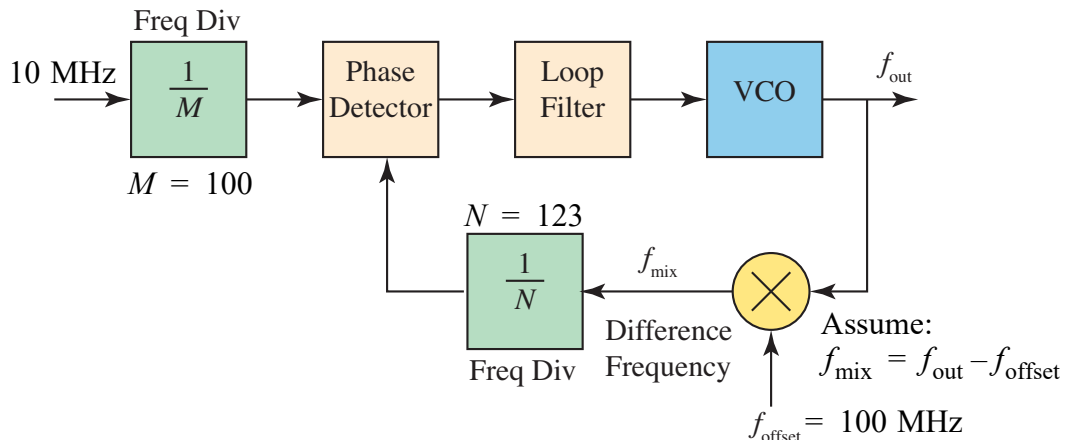


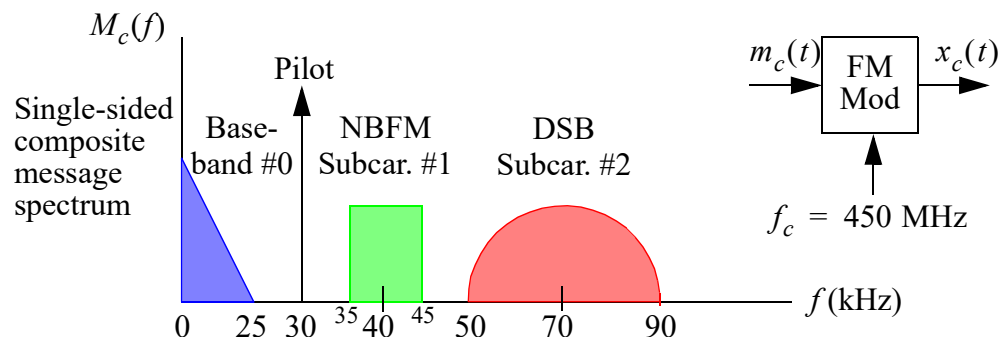
Set #10

Due Friday May 8, 2026

1. **Bonus 10.** Consider the PLL synthesizer shown below



- Find f_{out} for the parameters given in the above figure. Show your work
 - What value of M is required to make the frequency step size of the synthesizer be 10 kHz?
2. **To be turned in.** An FDM signal with composite spectrum shown below fre-



quency modulates a 450 MHz carrier. Draw a block diagram of a complete receiving system for the recovery of messages #0, #1, and #2 from $x_c(t)$. Include coherent demodulators which use the 30 kHz pilot carrier and use signal multipliers, frequency dividers, and frequency multipliers, as appropriate.

Appendix A

- Text A.1. Basic noise modeling on a single resistor.
- Text A.5. Noise due to a resistor circuit.
- To be turned in.** Text A.7. Amplifier cascade noise figure.
- Text A.9. Another amplifier cascade noise figure problem.
- Text A.10. Available noise power and signal power with antenna.
- To be turned in.** Text A.12 a–c. Link budget.

Final Exam on May 12 8-10 AM