Set #8

Due Friday April 17 at **12:00 PM**, 2026

Problems:

1. **To be turned in**. Z&T text 4.18.
1. **Bonus 10 points**: Z&T text 4.15.
2. Z&T text 4.20. Note the reference to text Figure 4.12 incorrectly refers to Figure 3.22. It should be Figure 4.3.

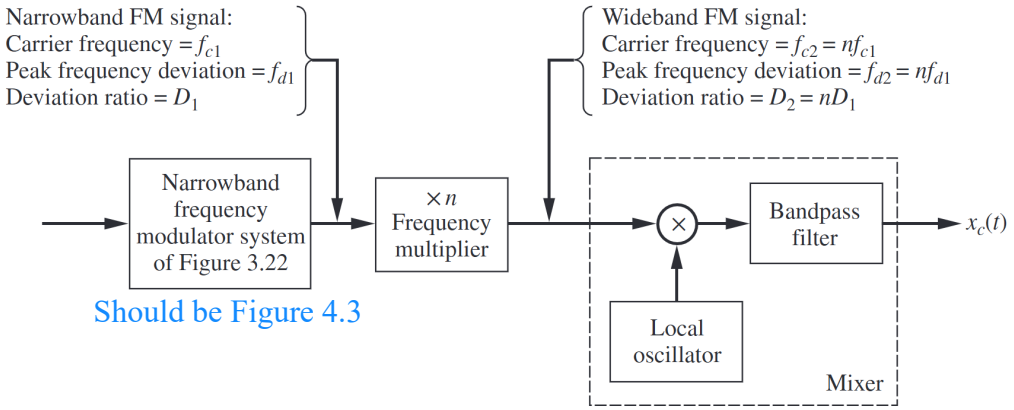

Figure 4.12
Frequency modulation utilizing narrowband-to-wideband conversion.

3. **To be turned in**. A 100 MHz sine-wave carrier is to be frequency modulated by a 10 kHz sine wave. An engineer designing the system reasons that he/she can minimize bandwidth by decreasing the audio amplitude (amplitude of 10 kHz sine wave message). He/she arranges for a maximum frequency deviation Δf of only ± 10 Hz away from the 100 MHz carrier frequency, and assumes that he/she requires only 20 Hz bandwidth.
   a.) Find the fallacy in the engineers reasoning, and specify the actual bandwidth required.
   b.) Would he/she have been right to assume a bandwidth of 2 MHz if the audio amplitude had been chosen to produce a Δf of 1 MHz? Explain the difference between the results of (a) and (b).
4. **Bonus 10 points:** Z&T text 4.21.
5. **To be turned in**. Z&T text 4.26.