

EE 567

Homework 4

Due Tuesday, September 24, 2019

Work all 4 problems.

Problem 1. Over the interval $0 \leq t \leq 1$ a PM signal is given by

$$s_{PM}(t) = 10 \cos(13,000\pi t).$$

It is known that the carrier frequency is 5000 Hz. If $k_p = 1000$ rad/volt determine $m(t)$ over the interval $0 \leq t \leq 1$.

Problem 2. Over the interval $0 \leq t \leq 1$ an FM signal is given by

$$s_{FM}(t) = 10 \cos(13,000\pi t).$$

It is known that the carrier frequency is 5000 Hz. If $k_f = 1000$ Hz/volt determine $m(t)$ over the interval $0 \leq t \leq 1$.

Problem 3. An angle modulated signal is described by

$$s(t) = 20 \cos(2\pi f_c t + 0.2 \sin(2\pi f_1 t))$$

where $f_c = 1$ MHz and $f_1 = 2$ kHz.

- Find the power of the modulated signal $s(t)$.
- Find the frequency deviation, Δf .

Problem 4. A carrier wave of frequency 25 MHz is frequency-modulated by a sine-wave of amplitude 5 volts and frequency 10 kHz. The frequency sensitivity of the modulator is 10 kHz per volt.

- Determine the approximate bandwidth of the FM wave using Carson's rule.
- Repeat part (a) assuming that the amplitude of the modulating wave is doubled.
- Repeat part (a) assuming that the modulation frequency is doubled.