

Q1) An FM modulator has the output

$$s(t) = 40 \cos(2\pi f_c t + 2\pi k_f \int_0^t m(\alpha) d\alpha)$$

where $k_f = 10 \text{ Hz/V}$. Assume that $m(t) = 5 \text{ rect}[0.5(t-1)]$.

- a) Sketch the phase deviation.
- b) Sketch the frequency deviation.
- c) Determine the maximum frequency deviation.
- d) Determine the maximum phase deviation.
- e) Determine the power of the modulator output.
- f) Determine the bandwidth of modulator output.

Q2) An FM modulator has $f_c = 100\text{MHz}$ and $k_f = 10$. The modulator has input $m(t) = 8 \cos(40\pi t)$.

- a) What is the modulation index?
- b) Is this narrowband FM? Why?
- c) If the same $m(t)$ is used for a phase modulator, what must k_p be to yield the index given in (a)?

Q3) In Fig.Q3, determine the value of $N_1, f_1, \Delta f_1, f_{lo}, f_b, \Delta f_b, f_2,$ and Δf_2 .

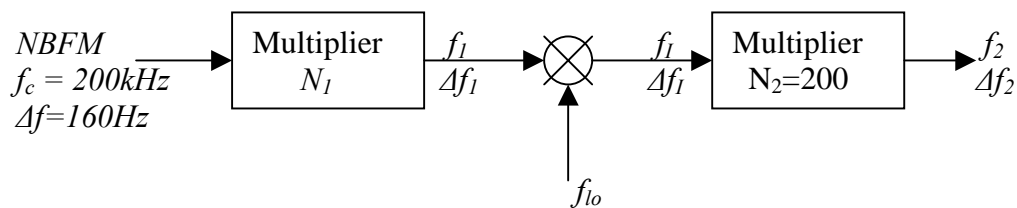


Fig.Q3