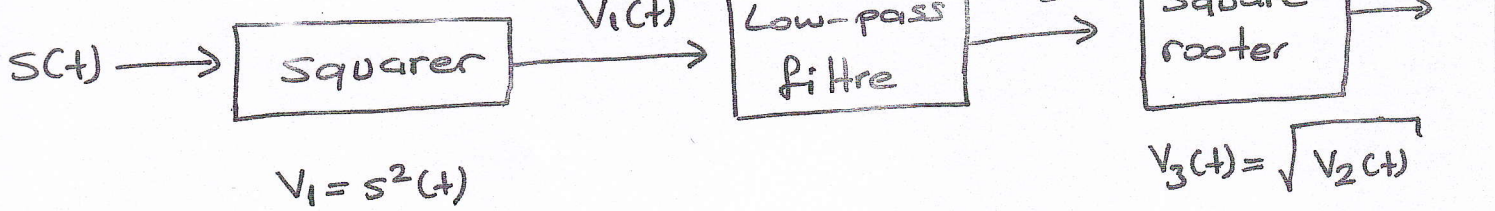
V.02

SORU:

The AM signal,

$$s(t) = A_c[1 + k_a m(t)]\cos(2\pi f_c t)$$

is applied to the system shown in Figure. Assuming that $|k_a m(t)| < 1$ for all t and the message signal $m(t)$ is limited to the interval $-W \le f \le W$ and that the carrier frequency $f_c > 2W$. Show that $m(t)$ can be obtained from the square rooter output $V_3(t)$.



Çözüm:

$$s(t) = A_c[1 + k_a m(t)]\cos(2\pi f_c t)$$

$$V_1(t) = s^2(t) = [A_c[1 + k_a m(t)]\cos(2\pi f_c t)] \cdot [A_c(1 + k_a m(t))\cos(2\pi f_c t)]$$

$$V_1(t) = A_c^2[1 + k_a m(t)]^2 \cos^2(2\pi f_c t)$$

$$V_1(t) = A_c^2[1 + 2k_a m(t) + m^2(t)] \cdot \frac{1}{2} \cdot [1 + \cos(4\pi f_c t)]$$

LPF çıkışı:

$$\frac{A_c^2}{2}[1 + 2k_a m(t) + m^2(t)] + \underbrace{\frac{A_c^2}{2}[1 + 2k_a m(t) + m^2(t)]}_{\text{sinyal}} \underbrace{[\cos(4\pi f_c t)]}_{\text{gürültü}}$$

$$V_2(t) = \frac{A_c^2}{2}[1 + 2k_a m(t) + m^2(t)].$$