V-01

M. SORUSU: A SSB signal is generated by modulating an 300 kHz carrier by the signal $x(t) = \cos(2000\pi t) + 2\sin(2000\pi t)$. the amplitude of the carrier is $A_c = 100$.

a-) Determine the signal $\hat{x}(t)$

b-) Determine the time domain expression for the lower ide band of the SSB – AM signal.

c-) Determine the magnitude of the spectrum of the lower sideband SSB signal

Çözüm:

a-) $\hat{x}(t) = \sin 2000\pi t - 2\cos 2000\pi t$

b) $x_c(t) = \frac{A_c}{2}\left[m(t)\cos 2\pi f_c t + \hat{m}(t)\sin 2\pi f_c t\right]$

c)

$$x_c(t) = \frac{A_c}{2}\left[(\cos 2\pi f_m t + 2\sin 2\pi f_m t)\cos 2\pi f_c t + (\sin 2\pi f_m t - 2\cos 2\pi f_m t) \times (\sin 2\pi f_c t)\right]$$

$$c(t) = \frac{A_c}{4}\left[\cos(w_c + w_m)t + \cos(w_c - w_m)t + 2\sin(w_c + w_m)t - 2\sin(w_c - w_m)t - \cos(w_c - w_m)t - \cos(w_c + w_m)t - 2\sin(w_c - w_m)t - 2\sin(w_c + w_m)t\right]$$

$$= \frac{A_c}{2}\left[\cos(w_c - w_m)t - 2\sin(w_c - w_m)t\right]$$

$$X_c(f) = \frac{A_c}{4}\left[\delta(f - f_c + f_m) + \delta(f + f_c - f_m) + j2\delta(f - f_c + f_m) - j2\delta(f + f_c - f_m)\right]$$