4·6−1

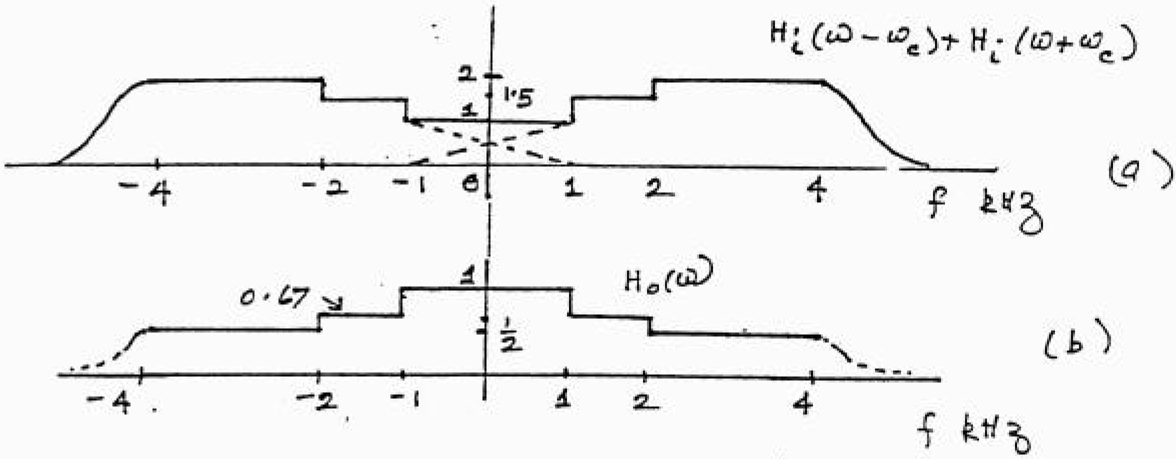

Fig. S4·6−1

$$H_o(\omega) = \frac{1}{H_i(\omega-\omega_c)+H_i(\omega+\omega_c)}$$

Figure S4·6−1a shows $H_i(\omega-\omega_c)+H_i(\omega+\omega_c)$, and Fig' S4·6−1b shows its reciprocal, which is $H_o(\omega)$.

4.8-1 The station can be heard at its proper frequency as well as at image frequency. The two frequencies are $2f_{IF}$ Hz apart. In the present case $f_{IF} = 455$ kHz

Hence the image frequency is $2 \times 455 = 910$ kHz apart

Hence the station will be heard if the receiver is tuned to frequency $1500 - 910 = 590$ kHz. The reason for this is as follows. When the station is tuned to 590 kHz, the local oscillator frequency $f_{LO} = 590 + 455 = 1045$ kHz. Now, this frequency f_{LO} is multiplied with the incoming signal $f_c = 1500$, the output has sum & difference frequencies, which are $1500 + 1045$ and $1500 - 1045 = 455$. The sum term is suppressed and the difference term has the carrier at 455 kHz. This passes through and the station is received.

4.8-2 The local oscillator generates frequencies in the range $(1+8)$ MHz to $(30+8)$ MHz, that is, 9–38 MHz range. When the receiver setting is 10 MHz, $f_{LO} = 10 + 8 = 18$ MHz. Now if there is a station at $18 + 8 = 26$ MHz it will beat (mix) with $f_{LO} = 18$ MHz to produce signals centered at

$$26 + 18 = 44 \text{ MHz and } 26 - 18 = 8 \text{ MHz}.$$

The sum component is suppressed by the IF filter. But the difference component is centered at 8 MHz and passes through the IF filter.