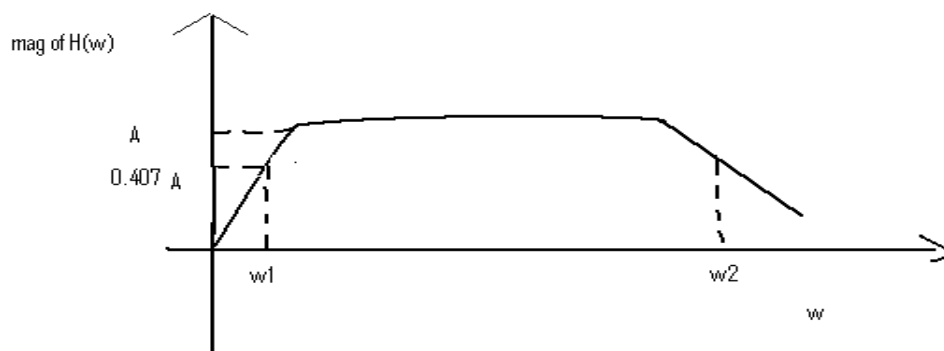# Banwidth Of A System

The constancy of the magnitude $H(j\omega)$ in a system is usually specified by its bandwidth. The bandwidth of a system is arbitrarily defined as the interval of frequencies over which the magnitude $|H(j\omega)|$ remains within $1/\sqrt{2}$ times (within3db) its value at the midband. The bandwidth of a system whose $|H(j\omega)|$ plot is shown in Figure has a bandwidth of $\omega_2 - \omega_1$.

For distortionless transmission, we obviously need a system with infinite bandwidth. Due to physical limitations, it is impossible to construct a system with infinite bandwidth. Actually, a satisfactory distrortionless transmission can be achieved by systems with finite but fairly large bandwidths. For any physical signal, the energy content decreases with frequency. Hence it is only necessary to construct a system which contain most of the energy of the signal. Attenuation of extremely high frequency components carry very little energy.

Figure 4.14

Band width = w1-w2