Problem 3.3

In AM, *spectral overlap* is said to occur if the lower sideband for positive frequencies overlaps with its *image* for negative frequencies. What condition must the modulated wave satisfy if we are to avoid spectral overlap? Assume that the message signal $m(t)$ is of a low-pass kind with bandwidth W.

Solution

The lowest frequency of the lower sideband is f_c - W, where f_c is the carrier frequency and W is the message bandwidth. To avoid spectral overlap, we must therefore satisfy the condition:

$$f_c - W > 0$$

Hence, f_c must always be greater than the message bandwidth W.