King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (071)
Quiz 3

Serial # 0
Key
-2 points for not writing your serial #

Name: KEY Sec. 1

Consider the frequency converter system shown in Figure **a** . The input signal $s_1(t)$ is a DSB-SC signal with carrier frequency of 10 MHz, as shown in Figure **b**. Specify **all possible** values for the frequency f_0 and filter characteristics (center frequency and possible bandwidth) required so that the output is an SSB with the spectrum shown in Figure **c**.

There are two possible values for f_0

$f_{0_1} = 99 - (-10) = 109$ MHz

$f_{0_2} = 99 - (10) = 89$ MHz

For the two cases an ideal filter of

Bandwidth = 1 MHz

&

f_c "center frequency" = 99.5 MHz

will do the job.

To check all possible values let us sketch the spectrum

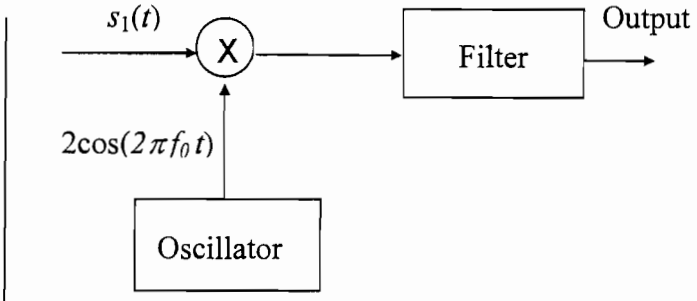


Figure a

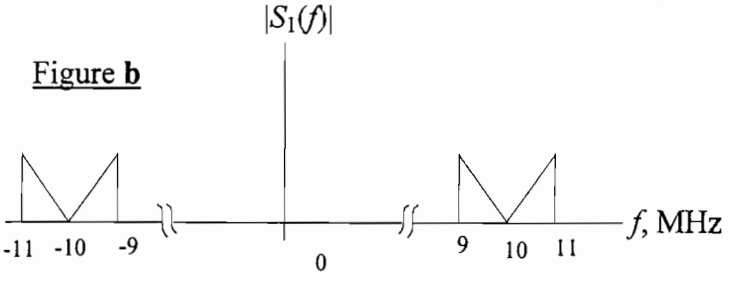


Figure b

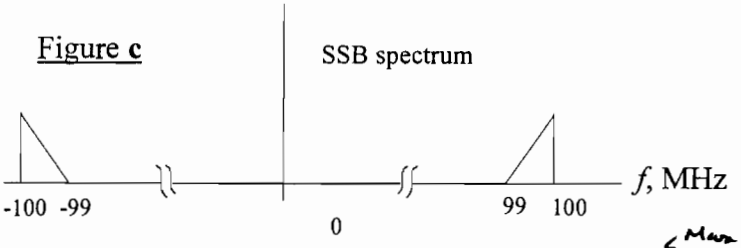
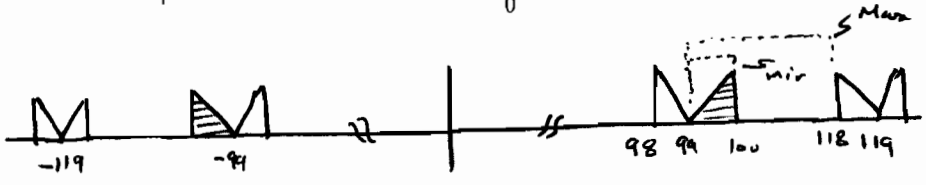


Figure c

Case I: $f_{0_1} = 109$ MHz

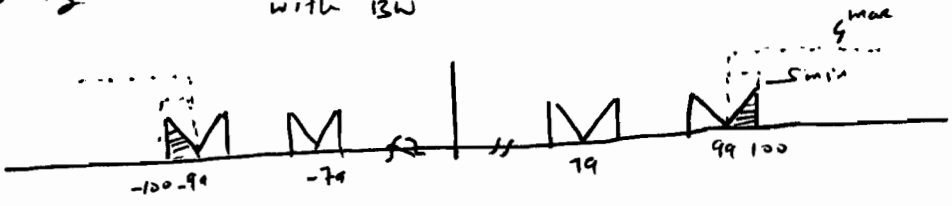
BW min = 1 MHz
f_c min = 99.5 MHz
BW max = 19 MHz
f_c max = $\frac{118-99}{2} = 108.5$ MHz



Note: that f_c should be changed in accordance with BW

Case II: $f_{0_2} = 89$ MHz

BW min = 1 MHz
f_c min = 99.5 MHz
BW max = ∞
f_c max = ∞



} Equivalent to a high pass filter with cut off freq = 99 MHz