Nasser Abbasi

ECE 405 QUIZ #2 20 POINTS SUMMER 2010

1. A message

$m(t) = 3.0 \cos(2\pi\times 2{,}000t)+6.2 \cos(2\pi\times 6{,}000t)$

amplitude modulates (AM) a carrier

$10 \cos(2\pi\times 100{,}000t)$

(a) Plot m(t) in the time domain for $0 \le t \le 1$ms.
(b) Plot the spectrum M(f) of m(t) in the frequency domain.
(c) Find the modulation index μ of this AM modulation.
(d) Plot the AM waveform in the time domain for $0 \le t \le 1$ms.
(e) Plot the spectrum of the AM waveform in the frequency domain.
(f) What is the bandwidth of the AM wave?

$= \frac{1}{2}(\cos(\alpha-\beta) + \cos(\alpha+\beta)$

$\frac{1}{2}(\cos(4) + \cos($

17/20

$= 3\cos(\alpha t) + 6.2\cos(\beta t)$.

m_1 m_2

$m(t) = 3.0 \cos(2\pi\ 2000t) + 6.2 \cos(2\pi\ 6000t)$

$c(t) = 10 \cos(2\pi\ 100{,}000t)$

let $m(t) = A_1 \cos(2\pi f_1 t) + A_2 \cos(2\pi f_2 t)$

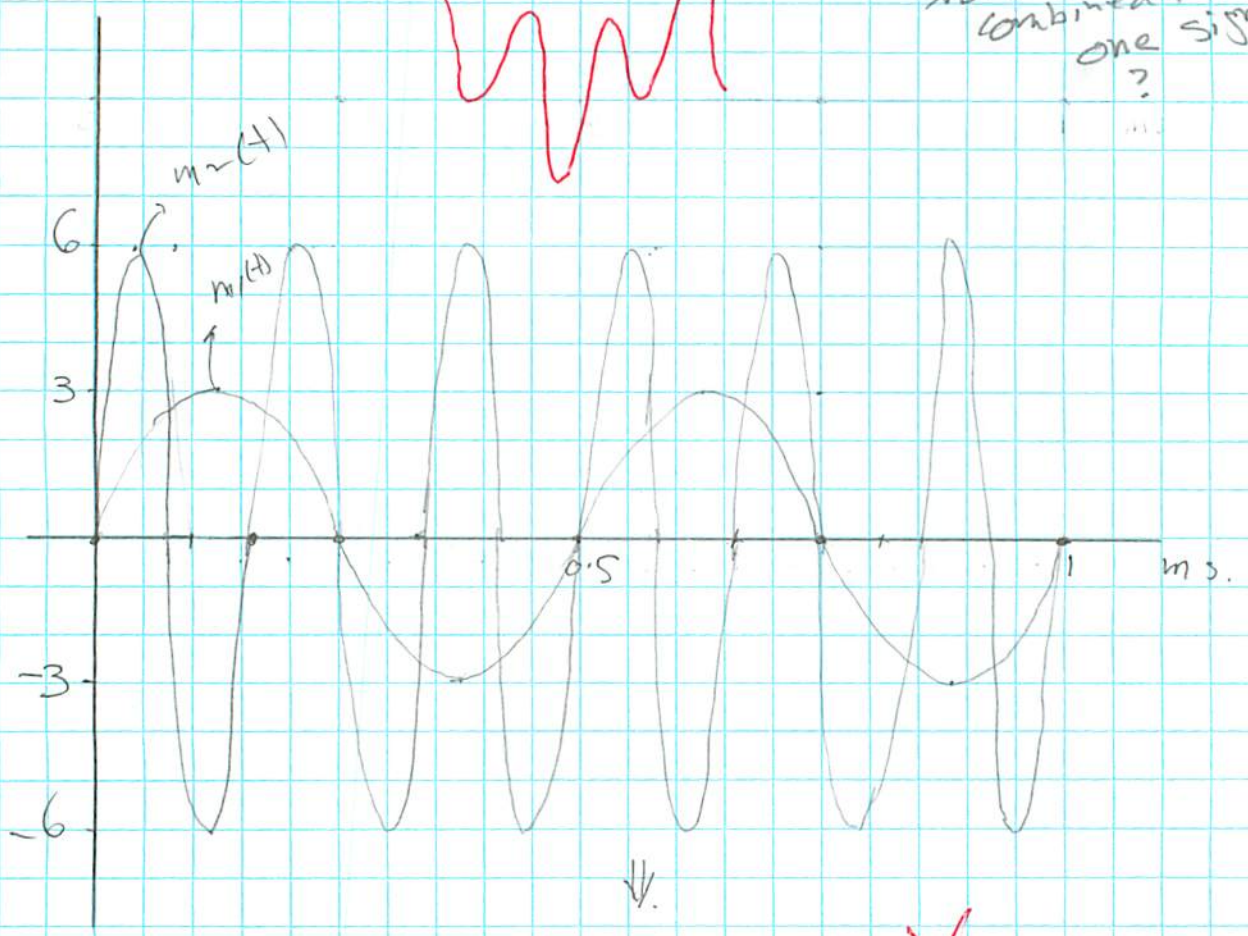
$c(t) = A_c \cos(2\pi f_c t)$

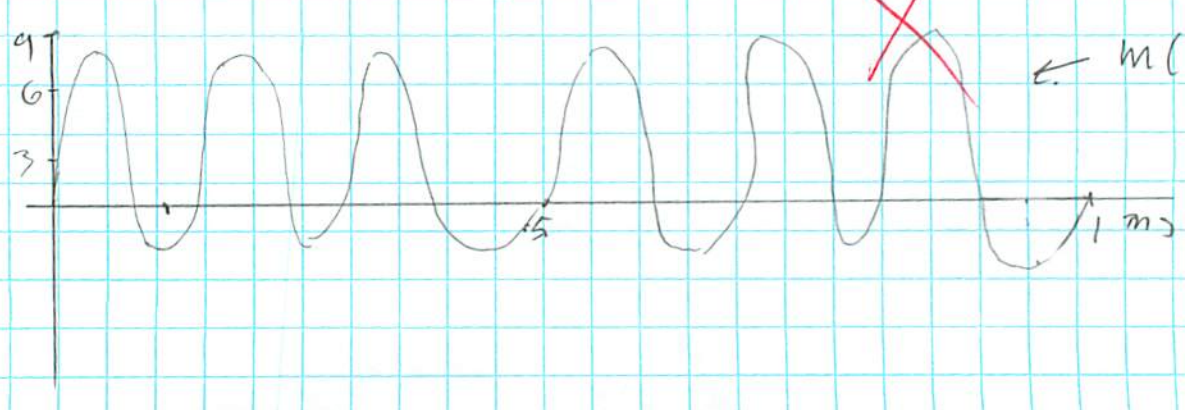
where $f_1 = 2\,KHz$, $f_2 = 6\,KHz$, $f_c = 100\,KHz$.

$T_1 = \frac{1}{2000} = \frac{1}{2}\,ms = 0.5\,ms.$, $T_2 = \frac{1}{6}\,ms. = 0.167\,ms$

(a)

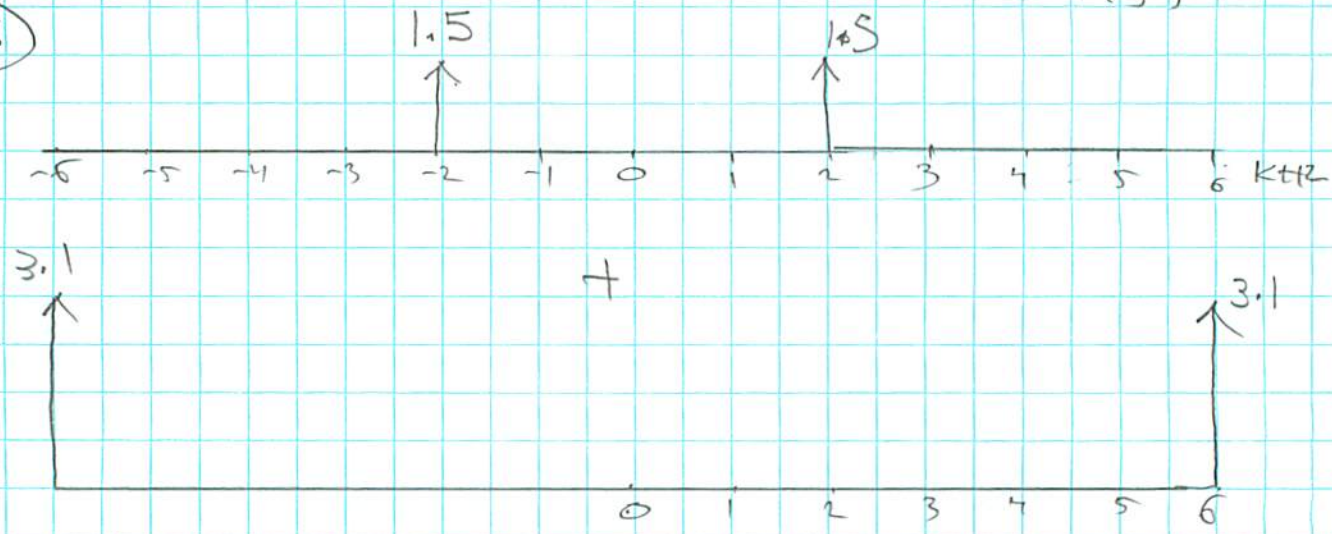
Should I have combined them into one signal ?





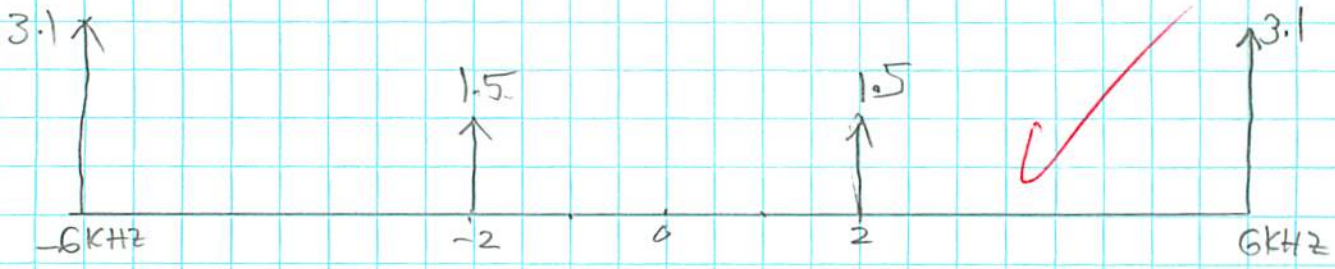
b)

$M_1(f)$


1.5
1.5
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
KHz

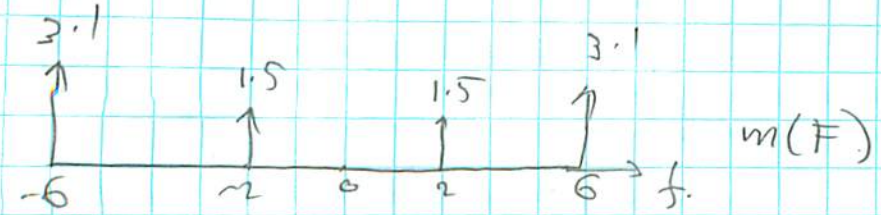
+

3.1
3.1
0
1
2
3
4
5
6

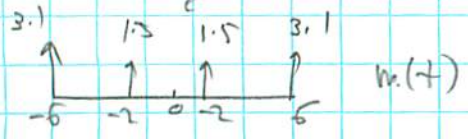

3.1
1.5
1.5
3.1
-6KHz
-2
0
2
6KHz

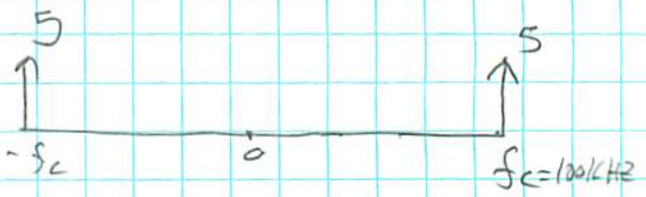
$M(f)$

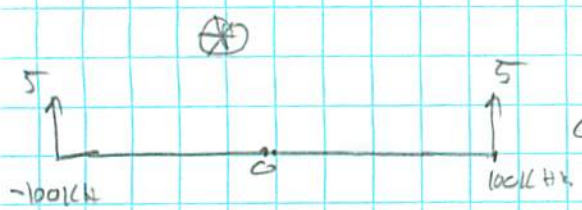
e)

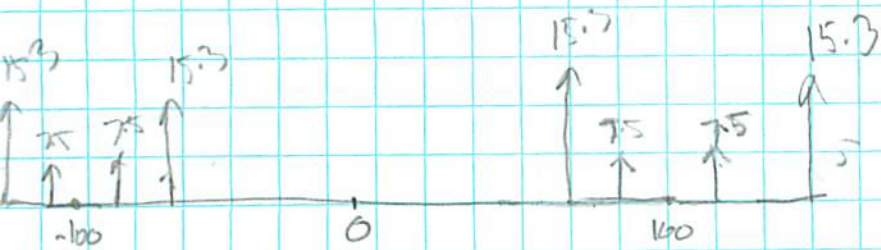


$(m(t)\cos\omega_c t) + A_c\cos\omega_c t$

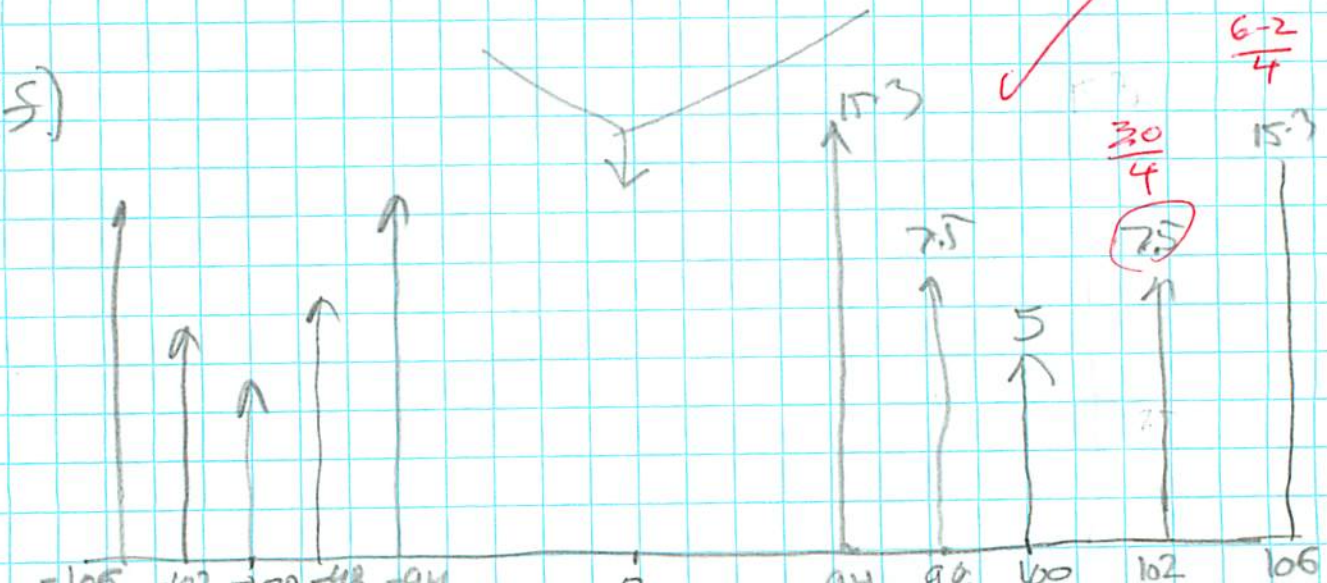


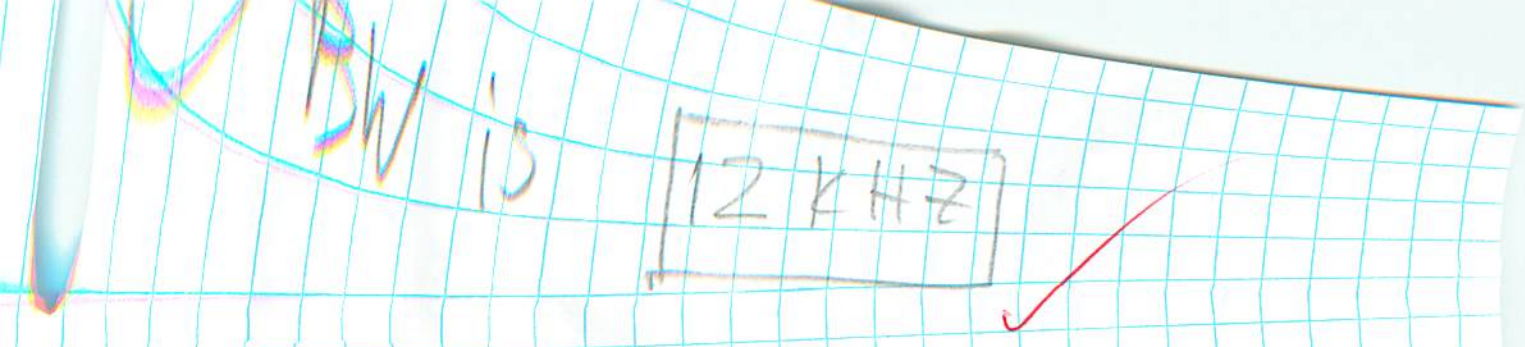






Am(f)




BW is
12 kHz