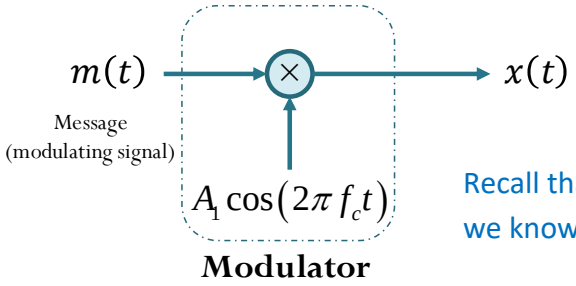
ECS 332: In-Class Exercise # 5 - Sol

Instructions

1. Separate into groups of no more than three students each.
   The group cannot be the same as any of your former groups.
2. Explanation is not required for this exercise **[ENRE]**
3. **Do not panic.**

Date: 0 6 / 0 9 / 2019			
Name	ID (last 3 digits)		

1. Consider a modulator below.



Recall that, when $X(f) = m(t)A_1\cos(2\pi f_c t)$, we know that

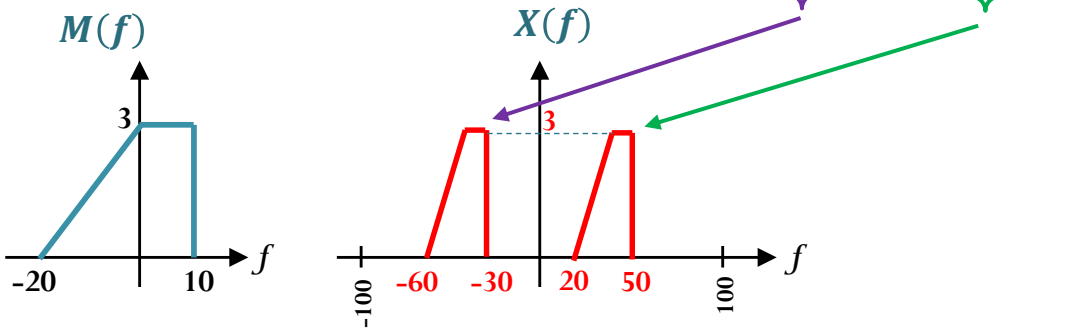
$$X(f) = \frac{A_1}{2}M(f - f_c) + \frac{A_1}{2}M(f + f_c).$$

Suppose $A_1 = 2$, f_c = 40 Hz, and the Fourier transform of the message is as plotted below.

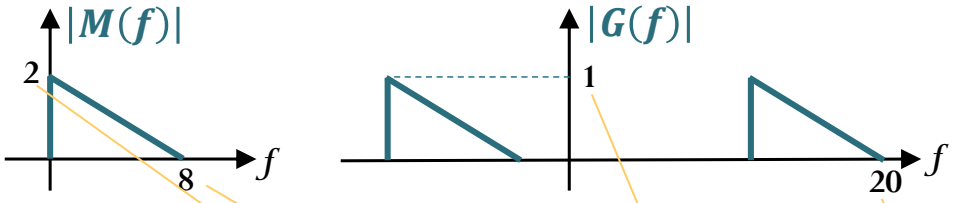
Here, $A_1 = 2$ and $f_c = 40$. Therefore,

$$X(f) = M(f + 40) + M(f - 40).$$

Plot $X(f)$ in the corresponding space below.



2. Consider two signals $m(t)$ and $g(t)$.
   The magnitude plots of their Fourier transforms are shown below.



In the time domain, suppose $g(t) = c_1 m(t)\cos(c_2 t)$ for some positive constants c_1 and c_2.

Find the values of the constants c_1 and c_2:

$c_1 =$ 1 , $c_2 =$ 24π .

From $g(t) = c_1 m(t)\cos(c_2 t) = c_1 m(t)\cos\left(2\pi\frac{c_2}{2\pi}t\right)$, we know that $G(f) = \frac{c_1}{2}M\left(f - \frac{c_2}{2\pi}\right) + \frac{c_1}{2}M\left(f + \frac{c_2}{2\pi}\right)$.

$\frac{c_1}{2} \times 2 = 1$ $\quad$ $8 + \frac{c_2}{2\pi} = 20$

$c_1 = 1$ $\quad$ $c_2 = 24\pi$