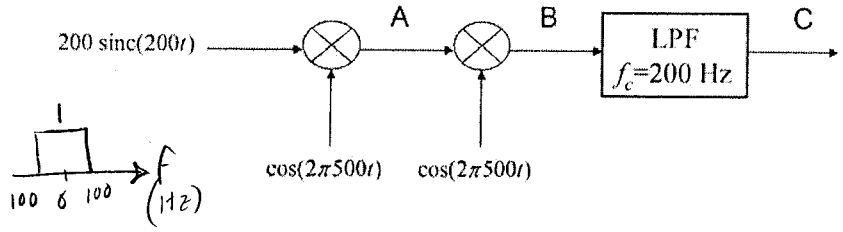
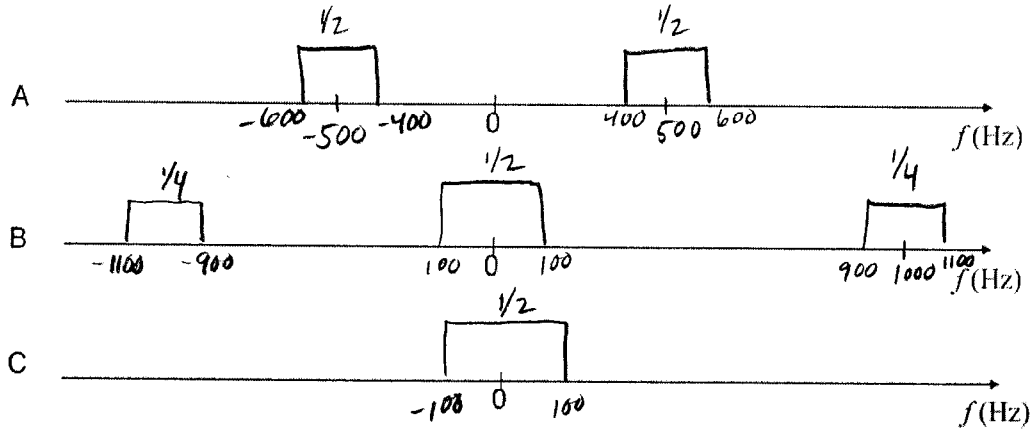
Name: Key

EE322 Fall 2008 Quiz 9

1. Given the system shown below, sketch the frequency spectrum at points A, B and C on the axes below.

$200\,\mathrm{sinc}(200t) \leftrightarrow 200 \cdot \frac{1}{200}\,\mathrm{rect}\left(\frac{f}{200}\right)$





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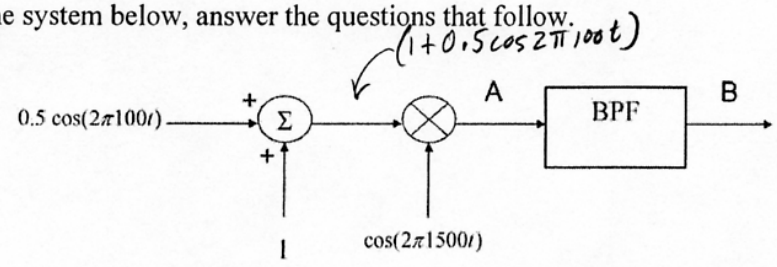
2. Given the system below, answer the questions that follow.



What is the average power of the carrier at point A?

$(1+.5\cos 2\pi 100t)\cos 2\pi 1500t = \cos 2\pi 1500t + \frac{1}{2}\cos 2\pi 1500t \cos 2\pi 100t$

$= \cos 2\pi 1500t + \frac{1}{4}\cos 2\pi 1400t + \frac{1}{4}\cos 2\pi 1600t$

$\frac{1^2}{2} = \boxed{\frac{1}{2}\,W}$ carrier

sidebands

What is the sideband power at point A?

$\frac{\left(\frac{1}{4}\right)^2}{2} + \frac{\left(\frac{1}{4}\right)^2}{2} = \frac{1}{32} + \frac{1}{32} = \boxed{\frac{1}{16}\,W}$

If the bandpass filter will pass frequencies from 1350 Hz to 2000 Hz, what is the total average power at point B?

all freqs pass

$\frac{1}{2} + \frac{1}{16} = \boxed{\frac{9}{16}\,W}$

If the bandpass filter will pass frequencies from 1000 to 1550 Hz, what is the total average power at point B? Upper sideband is removed

$1^2 + \frac{\left(\frac{1}{4}\right)^2}{2} = \boxed{\frac{17}{16}\,W}$

1^2: carrier; $\frac{\left(\frac{1}{4}\right)^2}{2}$: Lower sideband

If the bandpass filter will pass frequencies from 500-1000 Hz, what is the total power at point B?

$\boxed{0\,W}$

Bonus: Name the nations of 4 of the 5 major armies involved in the Battle of Leipzig.

France vs Austria
Prussia
Russia
Sweden