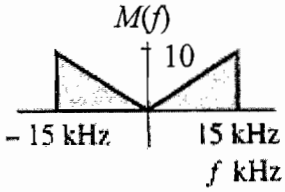
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (071)
Quiz 5

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

Name: KEY Sec. 4

1. Given two signals $m(t)$ with the spectrum shown in the figure and $g(t)$ which is band limited to 10 *k*Hz. Determine the minimum sampling (Nyquist) rate for the following signals.



$g(t)m(t)$, $5(g(t)+m(t))$, $dm(t)/dt$. *Justify your answer*

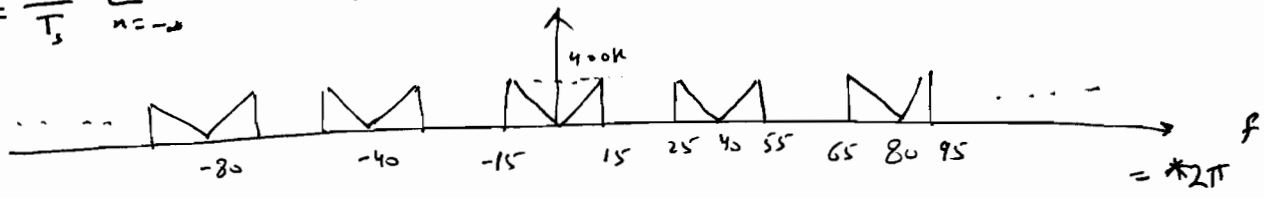
* Band width of $g(t)\,m(t)$ = 10K + 15K = 25K Hz
because multipilcation in time domain is equivalent to convolution in the frequancy domain.
Sampling rate = 2 * 25K = 50 KHz

* 5 (g(t) + m(t))
Scaling by constant does not change the width of the spectrum.
BW of g(t) + m(t) = max (BW (g(t)), BW (m(t)))
= 15 KHz ⇒ Sampling = 30 KHz

* $\frac{dm(t)}{dt}$: derivative does not change the BW of the signal (* jw). BW = 15 KHz
Sampling = 30 KHz

2. If the previous signal $m(t)$ is sampled at a rate of 40 kHz. Sketch the spectrum of the sampled signal. Show all details and show the final results. Can the signal be reconstructed?

$$\bar{G}(w) = \frac{1}{T_s} \sum_{n=-\infty}^{\infty} G(w - n w_s)$$



amplitude scaled by T_s

. Yes, the signal can be reconstructed using a lowpass filter
"It is sampled above Nyquist rate"
Please, see the quiz for the other section.

Good Luck, **Dr. Ali Muqaibel**