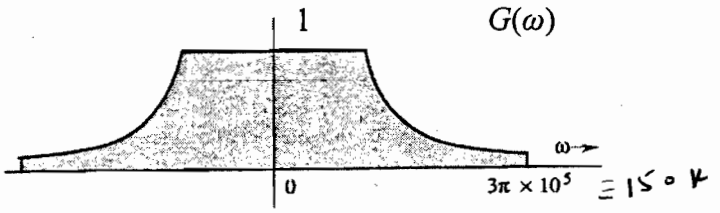
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (072)
Dr. Ali Muqaibel
Quiz 5

Serial # 0

-1 points for not writing your serial #

Name: KEY .

The figure below shows the spectrum of a signal $g(t)$



1. Determine the Nyquist interval and the sampling rate for $g(t)$ **(2 points)**

Max freq $= \frac{3\pi \times 10^5}{2\pi} = 1.5 \times 10^5$ Hz

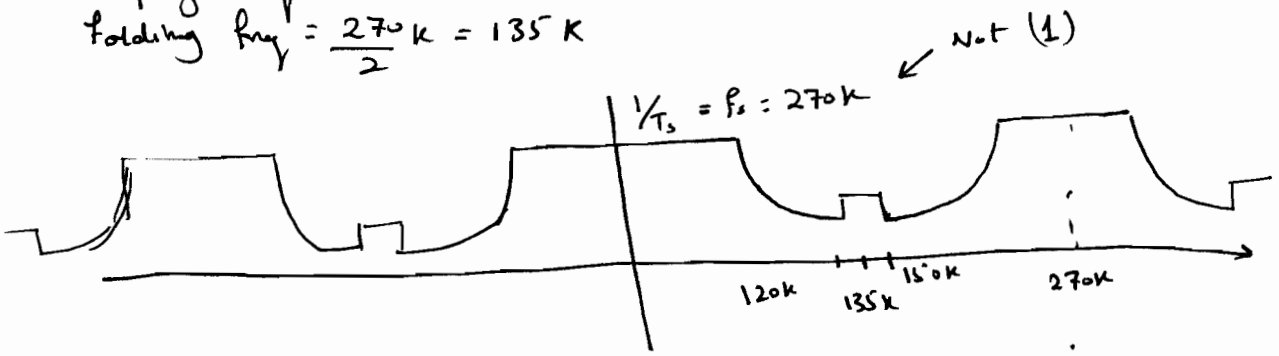
$\Rightarrow$ Nyquist Rate $= 2$(Max freq) $= 3 \times 10^5$ Hz (Samples/sec)

Nyquist Interval $= \frac{1}{\text{Nyquist Rate}} = \frac{1}{3 \times 10^5} = 3.33 \times 10^{-6} = 3.33$ μsec.

2. Sketch the spectrum of the sampled signal, if $g(t)$ is sampled (using uniformly spaced impulses) at **0.9* Nyquist rate** **(4 points)**

Sampling freq $= 0.9 * 3 \times 10^5 = 2.7 \times 10^5 \equiv 270$ K

folding freq $= \frac{270\text{K}}{2} = 135$ K



3. Explain whether you can recover the signal $g(t)$ from the previous sampled signal. **(2 points)**

We cannot recover the signal
it is sampled at less than Nyquist Rate
see the figure above.

4. Determine the Nyquist sampling rate for $g^3(t)$. **(2 points)**

multiplication in time $\Rightarrow$ convolution in frequency

$f_{s\,new} = 3 * (300\text{KHz}) = 900$ K Hz

because the [Bandwidth of $g^3(t)$] $= 3 *$ Bandwidth of $g(t)$