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| **Prof. Y. Nasser** | **American University of Beirut****Department of Electrical and Computer Engineering****EECE 442 – Communication Systems** | **Fall 2013-2014** |
|  | Homework 1 (Due September 20, 2013) |  |

**Objective of this HW: get familiar with Fourier transform; hands-on experience on Matlab and signal processing for communications.**

**Note: you can work in groups of two students.**

**Estimated time: 75 minutes**

**Problem 1**: Given a function $g\left(t\right)=R\left[g\left(t\right)\right]+jI\left[g\left(t\right)\right]$.

Express the Fourier transform of $R\left[g\left(t\right)\right]$and $jI\left[g\left(t\right)\right]$ in terms of *G*(*f*) the Fourier transform of $g\left(t\right)$

**Problem 2**: Given a function $g\left(t\right)=at for 0\leq t\leq T and 0 elsewhere ;$ where *a* and *T* are two given variables.

1. Find the Fourier Transform *G*(*f*) of $g\left(t\right)$. Deduce its maximum, and its bandwidth.
2. What is the sampling frequency of g(t) so that the Nyquist condition is satisfied.
3. We compose the signal $x\left(t\right)=\sum\_{n=-\infty }^{\infty }g\left(t-nT\right)$. Express the Fourier Transform of *X*(*f*) in terms of *G*(*f*).

**Problem 3**: Solve Problem 2.12 of the textbook

**Problem 4**: Solve Problem 2.23 of the textbook

**Problem 5**: Solve Problem 2.24 of the textbook

**Problem 6**: Solve Problem 2.26 of the textbook