# AY121 Course Assessment Questions—Lab 1 related

YOUR NAME:

1. When digitally sampling a signal whose maximum frequency is $f_s$, one must sample at least as fast as

   (a) $f_s/4$

   (b) $f_s/2$

   (c) $f_s$

   (d) $2f_s$ **correct**

   (e) $4f_s$

2. After sampling a time series $E(t)$ with $3 \times 10^6$ points, you want to digitally calculate the power spectrum and include it in your lab report. Let $E(f)$ be the Fourier transform of $E(t)$. The power spectrum $P(f)$ is given by

   (a) $P(f) = E(f)E(f)$, where E(f) is calculated with the Discrete Fourier Transform

   (b) $P(f) = E(f)E(f)^*$, where E(f) is calculated with the Discrete Fourier Transform

   (c) $P(f) = E(f)E(f)$, where E(f) is calculated with the Fast Fourier Transform

   (d) $P(f) = E(f)E(f)^*$, where E(f) is calculated with the Fast Fourier Transform **correct**

3. When calculating the Fourier transform of a time series with the Discrete Fourier Transform, the concept of "negative frequencies" is important under what circumstances?

   (a) When the input time series is a single set of real samples

   (b) When the input time series is a single set of imaginary samples

   (c) When the input time series is a single set of complex samples

   (d) Always; negative frequencies are always important **correct**

   (e) Never; negative frequencies never occur with real data.

4. When calculating power spectrum of a time series, the term "leakage power" refers to

   (a) distortions of the calculated spectrum resulting from numerical accuracy considerations

   (b) power transferred from positive to negative frequencies resulting from numerical roundoff in the Fourier transorm

   (c) power transferred to nearby frequencies because of approximations involved in the digital sampling and calculation process

   (d) power transferred to nearby frequencides because of numerical accuracy considerations

(e) power transferred to nearby frequencides because we don't live forever **correct**

5. A sideband-separating mixer works by combining a local oscillator and a signal in the following ways:

   (a) Adding the two signals in two power splitters, one of which has the l.o. delayed by $\pm 0°$ or $180°$.

   (b) Adding the two signals in two power splitters, one of which has the l.o. delayed by $\pm 90°$ or $270°$.

   (c) Multiplying the two signals in two mixers, one of which has the l.o. delayed by $\pm 0°$ or $180°$.

   (d) Multiplying the two signals in two mixers, one of which has the l.o. delayed by $\pm 90°$ or $270°$. **correct**

6. In order to obtain shift the frequency of a signal at frequency $f_{sig}$ to a more convenient frequency for analysis

   (a) one adds the two signals using a power splitter

   (b) one adds the two signals using a mixer

   (c) one multiplies the two signals using a power splitter

   (d) one multiplies the two signals using a mixer. **correct**

7. When you write a subroutine or procedure to perform a certain computational task, first thing you should do is

   (a) Write down the equations needed, including all numerical constants required

   (b) Take a first stab at writing the documentation **correct**

   (c) Create a test case, whose inputs and outputs you can determine independently, for checking your program

8. The advangtages of LaTeX over Microsoft Office include (Mark ALL correct answers!):

   (a) It is free **correct**

   (b) It is terrific for mathematics **correct**

   (c) It allows reference to equations, figures and tables by name. **correct**

   (d) It is used by most scientists and mathematicians **correct**

   (e) it is used in most govermental organizations

   (f) it is used by most of the public

   (g) it is usable on all operating systems **correct**