ESE 406/505 & MEAM 513 – 2013-03-20 – Quiz – Name:_____

- Choose the one best answer for each question by circling the letter.
- A correct answer is worth 2 points.
- No answer is worth 0 points.
- An incorrect answer is worth -1 point. Random guessing will lower your score, on average.

1. The Nyquist frequency of a discrete-time process is...
   A. ...the maximum frequency at which a given digital computer can execute the necessary commands.
   B. ...the maximum frequency present in the process and is equal to half the sampling frequency.
   C. ...the frequency at which the amplitude of a sampled analog signal has been reduced by 3dB.
   D. ...the frequency at which the gain of a digital compensator is 0dB (unity gain).

2. Which of the following is LEAST CORRECT concerning our study of discrete-time dynamic systems?
   A. The discrete-time equivalent of a linear differential equation is a linear difference equation.
   B. The discrete-time equivalent of the Laplace Transform is the Z-transform.
   C. When a continuous-time signal is converted to discrete-time by sampling, the Laplace-transform pole is exactly mapped to a Z-transform pole according to $z = e^{Ts}$.
   D. Aliasing won't exist as long as the sample time, T, is less than 16 ms (aka one "svedberg").

3. A transfer function, $G(z)$, represents a stable discrete-time system if…
   A. …all of the poles of $G(z)$ lie in the left half-plane.
   B. …all of the poles of $G(z)$ lie inside the unit circle.
   C. … $|G(z)| < 1$ when $|z| < 1$.
   D. … $|G(z)| \to 0$ as $|z| \to \infty$.

4. The difference equation, $u[k] = 0.8u[k-1] + 3.0e[k] - 2.4e[k-1]$, corresponds to which transfer function?
   A. $G(z) = 0.8z + 3.0 - 2.4z^{-1}$
   B. $G(z) = z^{-2} - 0.8z^{-1} + 3.0 - 2.4z$
   C. $G(z) = \dfrac{3.0 - 2.4z^{-1}}{1 - 0.8z^{-1}}$
   D. $G(z) = \dfrac{1 - 3.0z^{-1}}{0.8 - 2.4z^{-1}}$

5. Which of the following is LEAST CORRECT concerning "Tustin's Method"?
   A. It is a useful way to convert a continuous-time transfer function into a discrete-time transfer function.
   B. It preserves the exact discrete-time stability boundary.
   C. It exactly matches continuous-time frequencies.
   D. It can be derived by considering trapezoidal integration as an approximation to "1/s".