ESE 406/505 & MEAM 513 – 2011-Apr-11 – 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 freqeuncy.
    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. If 120Hz continuous-time noise (the second harmonic of 60Hz electrical equipment) is sampled by a discrete-time process running at 200Hz, at what frequency will the resulting discrete-time noise be observed?
    A. 120Hz
    B. 100Hz
    C. 80Hz
    D. 20Hz

3. Using a "10-bit" analog-to-digital conversion with an input range of 0 to 10 volts results in what resolution on the digital signal (in other words, what is the voltage change corresponding to a change in the LSB)?
    A. About 0.01 volts
    B. About 0.1 volts
    C. About 1.0 volts
    D. About 10 volts

4. 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 $z=\cos(\pi Ts)$.
    D. The stability boundary for poles of discrete-time systems is the unit circle.

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".

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

2. If 120Hz continuous-time noise (the second harmonic of 60Hz electrical equipment) is sampled by a discrete-time process running at 200Hz, at what frequency will the resulting discrete-time noise be observed?
    A. 20Hz
    B. 80Hz
    C. 100Hz
    D. 120Hz

3. Using a "10-bit" analog-to-digital conversion with an input range of 0 to 10 volts results in what resolution on the digital signal (in other words, what is the voltage change corresponding to a change in the LSB)?
    A. About 0.01 volts
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4. Which of the following is LEAST CORRECT concerning our study of discrete-time dynamic systems?
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