

1. The static sensitivity of the thermocouple calibrated in the second lab was constant (for both water and air use).
 - a. True
 - b. False
2. The time constant, τ , of the thermocouple used in the second lab was constant for both water and air use.
 - a. True
 - b. False
3. Impatience while doing the static calibration of the thermocouple in the second lab
 - a. would contribute to hysteresis error.
 - b. would exaggerate the bias error.
 - c. would minimize S_{xy} .
 - d. All of the above
 - e. None of the above
4. What portion of the repeated sampling of a static temperature signal are within one standard deviation of the true mean value?
 - a. 5%
 - b. 50%
 - c. 68%
 - d. 95%
5. A zero order sensor will attenuate and delay the output with respect to the input.
 - a. True
 - b. False
6. The frequency bandwidth of a first order instrument is defined as the frequency below which $M(\omega)=0.707$, or output/input power is -3 dB.
 - a. True
 - b. False
7. The most common dial pressure gauge contains a Bourdon Tube.
 - a. True
 - b. False
8. The variance is equal to the standard deviation of signal.
 - a. True
 - b. False
9. An exponential equation, $y(x) = A + Be^{-x/C}$, fit to a data set with 25 points has how many degrees of freedom?
 - a. 21
 - b. 22
 - c. 23
 - d. 24
10. A correlation coefficient, R , of 0.92, indicates a high quality fit to the data.
 - a. True
 - b. False

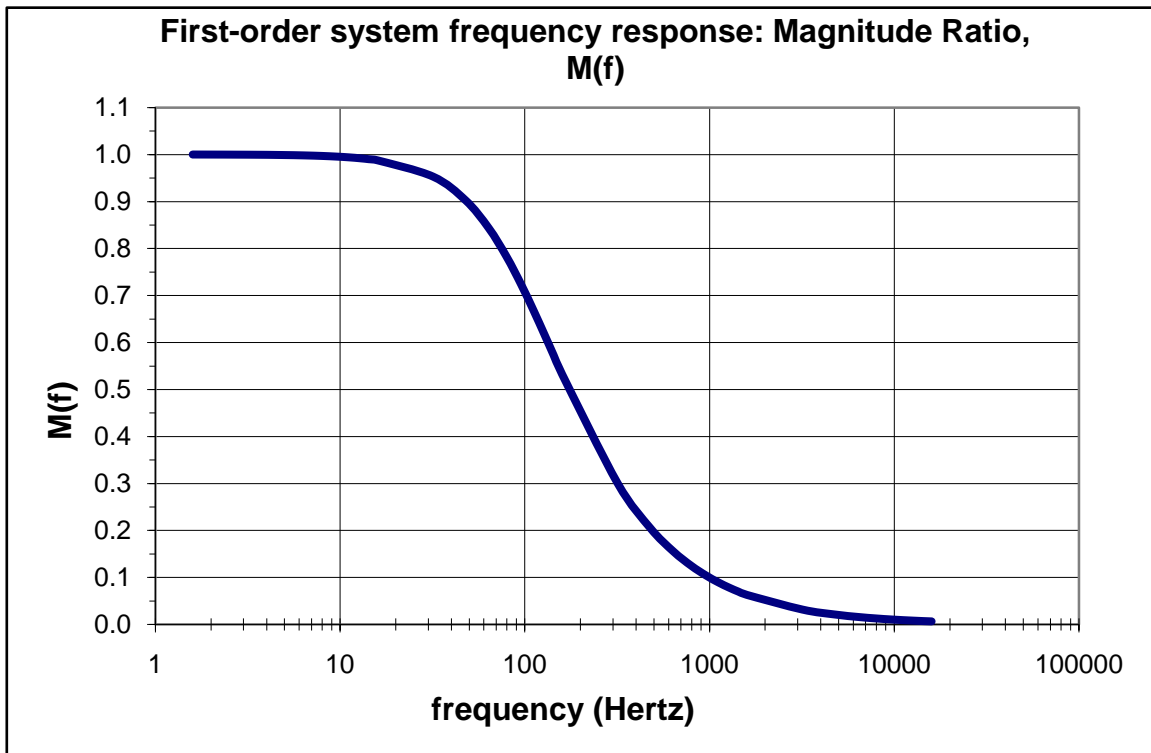


Figure 1. Magnitude Ratio, (output/input vs. frequency), of first order sensor like the thermocouple used in Lab 2.

11. The approximate time constant, τ , of the thermocouple response plotted in Figure 1 is:
- 1/100 seconds
 - 1 seconds
 - 100 seconds
 - 10 seconds
 - 40 seconds
12. A very small, very sensitive thermocouple will reach a steady state value sooner for a small step input than a large step input.
- True
 - False
13. An instrument's accuracy is a measure of the random fluctuations in output for repeated applications of the same input.
- True
 - False
14. Which ADC setup would result in the best approximation of the mean value of the function: $y(t) = 3.2 + 4 \cos 2\pi t + 2 \sin 7\pi t$?
- 1,000 samples at 2,000 samples/second
 - 1,000 samples at 1,000 samples/second
 - 1,000 samples at 10 samples/second
 - 5,000 samples at 10,000 samples/second
 - 5,000 samples at 5,000 samples/second

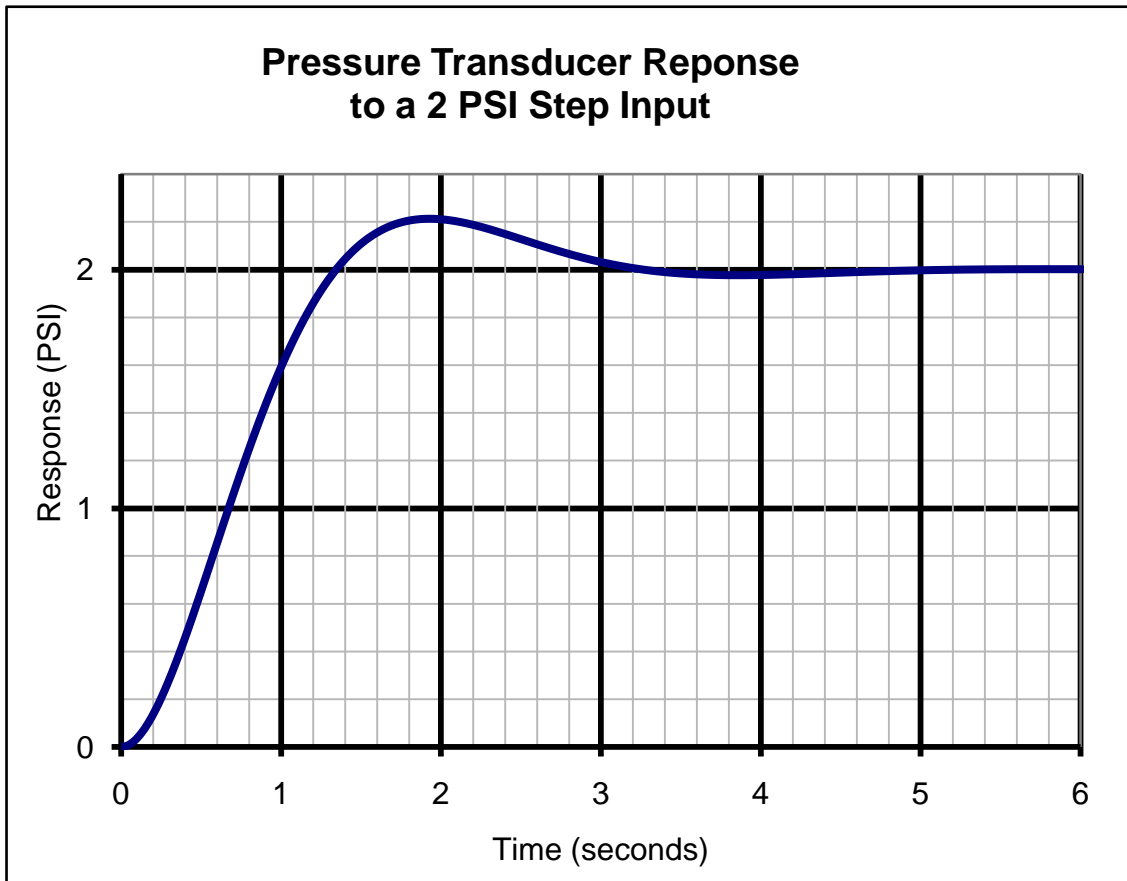


Figure 2. Pressure transducer time response to a step input function.

15. The settling time in seconds of the pressure transducer plotted in Figure 2 is approximately
- 1
 - 2
 - 3
 - 4
 - 5
16. The ADC architecture normally associated with the fastest conversion rate is
- Flash
 - Pipelined
 - Successive approximation
 - Sigma-delta
17. A 95 Hz sine wave sampled at 100 Hz will result in a sampled data set with what frequency
- 95 Hz
 - 5 Hz
 - 45 Hz
 - 55 Hz
 - none of the above
18. Heat loss to the laboratory surroundings from the calorimeter used in lab 3 was modeled with the equation, $Q = H(T_{calorimeter} - T_{lab})$
- True
 - False

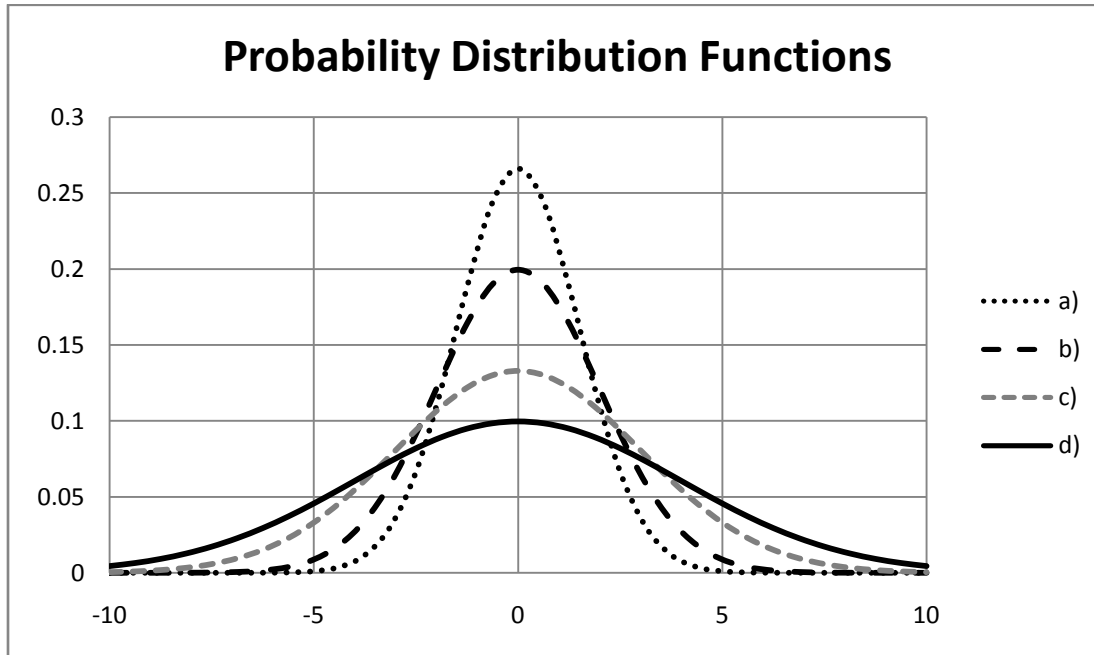


Figure 3. Sample probability functions, $p(x)$.

19. Which of the probability distribution functions in Figure 3 has the smallest standard deviation?

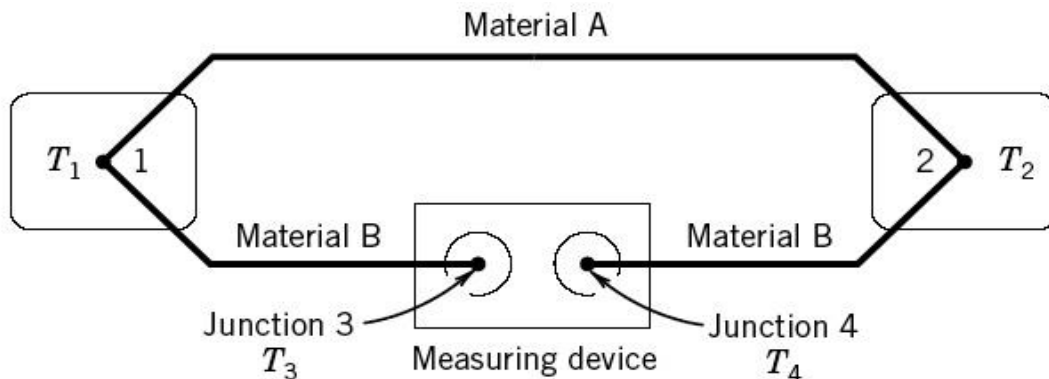


Figure 4. Example thermocouple connection configuration.

20. The thermocouple configuration in Figure 4 will measure what temperature if the junction is at constant temperature ($T_4 = T_3 \neq T_2 \neq T_1$)?

- a. $(T_1 - T_2)$
- b. $(T_1 - T_2) - T_3$
- c. $(T_1 - T_3) + (T_2 - T_4)$
- d. None of the above

21. For a normal distribution of x_i about some sample mean value, $x_i = \bar{x} \pm CI$, the confidence or precision interval is expressed as:

- a. $\pm t_{v,p} S_x (P\%)$
- b. $\pm t_{v,p} S_{\bar{x}} (P\%)$
- c. $\pm t_{v,p} S_{yx} (P\%)$
- d. None of the above

