Quiz 6 All questions are True/False

1. Halloween November 1st.

2. $\int_{-\infty}^{\infty} \delta(t)dt = 1$ **where** $\delta(t)$ **is the delta function.**

3. $y(t) = \int_{-\infty}^{\infty} h(t-\Delta)F\Delta d\Delta = h(t)$ **where** $h(t)$ **is the impulse response or transfer function and** $F(\Delta)$ **is the input impulse or delta function.**

4. The time constant of a first order low pass Butterworth filter is τ = RC.

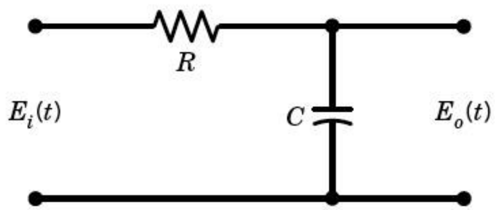


Figure 6.29 Low-pass *RC* Butterworth filter circuit.

Quiz 7

Determine the uncertainty in a standard analog speedometer reading of 80 mph given the following information. The speedometer is graduated in 5 mph increments. The accuracy of the speedometer (95%) is stated to be 5%.

5. What is the zero order uncertainty in measurement?

a. ± 5 mph **c. ± 2.5 mph**
b. ± 4 mph **d. ± 2 mph**

6. **What is the instrument elemental error?**
   a. **± 5 mph** c. **± 2.5 mph**
   b. **± 4 mph** d. **± 2 mph**
7. **What is the design stage uncertainty of this measurement system?**
   a. **u_d = ± (5 + 4) mph** c. **u_d = ± $(5^2 + 4^2)^{½}$ mph**
   b. **u_d = ± $(2.5 + 4)^{½}$ mph** d. **u_d = ± $(2.5^2 + 2^2)^{½}$ mph**

Determine the 95% uncertainty in a vector magnitude measurement $V = (v^2 + w^2)^{1/2}$ at position $\bar{v}, \bar{w}$ given the following information. $v = b_0 + b_1 y, S_{\bar{y}}$. $w = c_0 + c_1 z + c_2 z^2, S_{\bar{z}}$. All the data is based on a 100 point data set. The following are (T/F) questions.

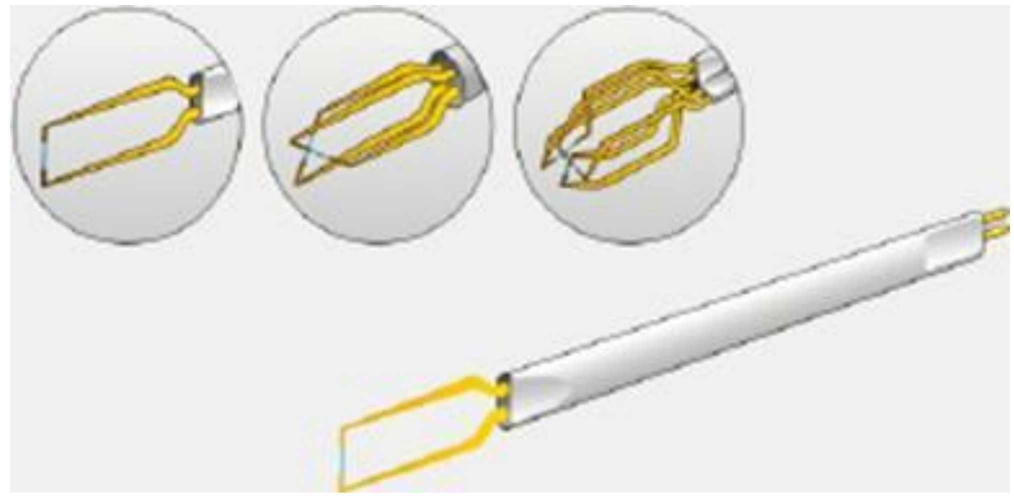
8. **The uncertainty in the $\bar{v}$ position measurement, $u_{\bar{v}}$, is the last term in the equation,** $\bar{v} \pm \delta v = (b_0 + b_1\bar{y}) \pm (b_1 t_{99,95\%} S_{\bar{y}})$
9. **The uncertainty in the $\bar{w}$ position measurement, $u_{\bar{w}}$, is the last term in the equation,** $\bar{w} \pm \delta w = (c_0 + c_1\bar{z} + c_2\bar{z}^2) \pm ((c_1 + 2\bar{z}c_2) t_{99,95\%} S_{\bar{z}})$
10. **The uncertainty $u_{\bar{V}}$ in the final vector magnitude at $\bar{v}, \bar{w}$ is** $\pm\left[\left(\frac{\partial V}{\partial y} u_{\bar{v}}\right)^2 + \left(\frac{\partial V}{\partial z} u_{\bar{w}}\right)^2\right]^{1/2}$

Quiz 8

11. If $u_0 = \pm 2.5$ mph and $u_c = 4$ mph , then $u_d = \pm\sqrt{2.5 + 4}$.

   a. True

   b. False



12. A hot wire anemometer is used to measure air velocity. The energy conducted away from the electrically heated wire is related to the overall heat transfer coefficient, H, of the wire. Should the heat capacity of the wire, C_{wire}, be large?

   a. Yes

   b. No

13. You should measure current flow with a high input impedance meter.

   a. True

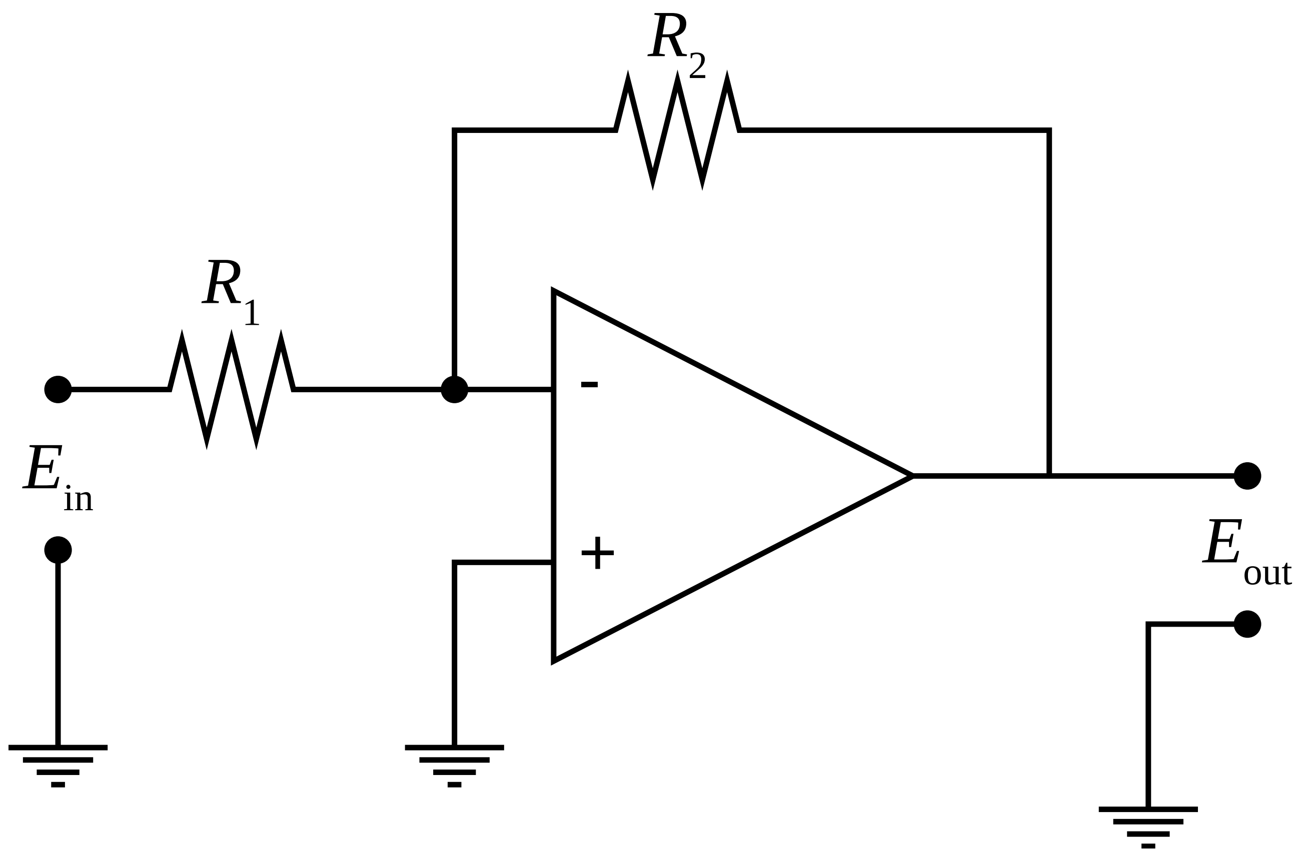
   b. False

14. You should measure pressure with a high input impedance meter.

   a. True

   b. False

Quiz 9



15. The amplifier circuit to the right is called a voltage follower.
- **a. True**
- **b. False**

16. The voltage present at the negative input to the amplifier is zero.
- **a. True**
- **b. False**

17. The gain of the amplifier circuit is R_1/R_2.
- **a. True**
- **b. False**

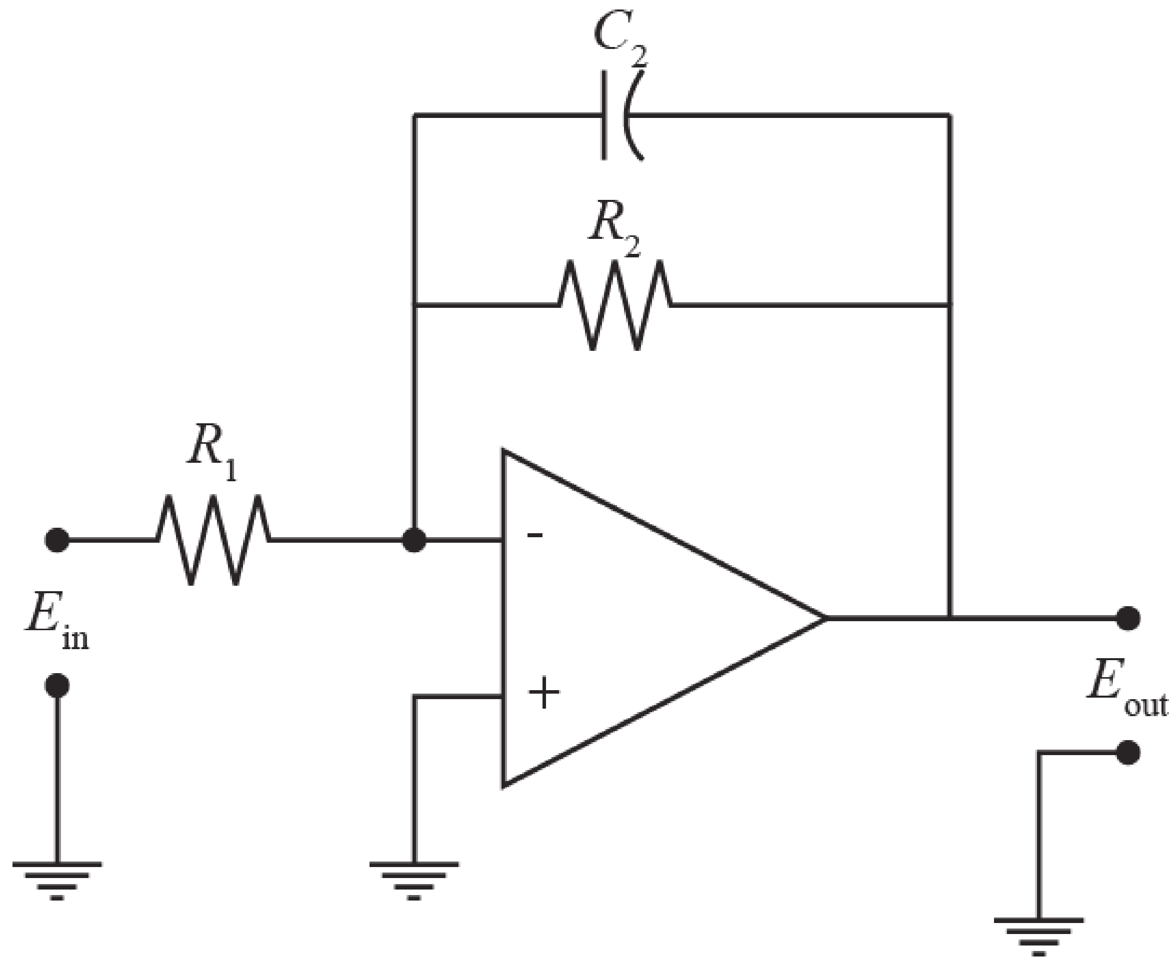
18. The current flow across resistor R_2 is E_{out}/R_2.
- **a. True**
- **b. False**

19. The input impedance of this amplifier circuit is R_1.
- **a. True**
- **b. False**

Quiz 10

20. **The amplifier circuit to the right is a first order, single stage, Butterworth low pass filter.**
    a. **True**
    b. **False**

21. **The cutoff frequency of the filter circuit is**
    a. $f_c = \frac{1}{2\pi R_1 C_2}$
    b. $f_c = \frac{1}{2\pi R_2 C_2}$
    c. $f_c = \frac{1}{R_1 C_2}$
    d. $f_c = \frac{1}{R_2 C_2}$



22. **The static sensitivity of the amplifier circuit is R_2/R_1.**
    a. **True**
    b. **False**

23. **The input impedance of this amplifier circuit is R_1.**
    a. **True**
    b. **False**