Quiz 6

All questions are True/False

1. Halloween November 1st. True

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

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. True**

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

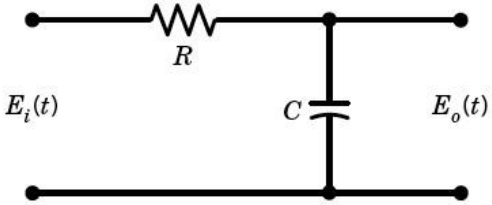


Figure 6.29 Low-pass *RC* Butterworth filter circuit. **True**

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. $u_d = \pm (5 + 4)$ mph **c. $u_d = \pm (5^2 + 4^2)^{½}$ mph**

b. $u_d = \pm (2.5^2 + 4^2)^{½}$ mph **d. $u_d = \pm (2.5^2 + 2^2)^{½}$ 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.

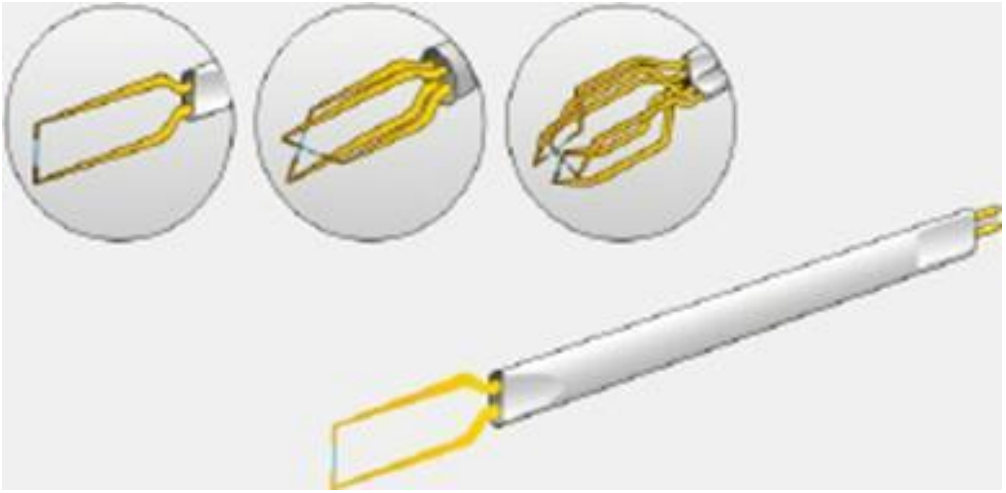
8. **The uncertainty in the $\bar{v}$ position measurement, $u_{\bar{v}}$, is the last term in the equation, $\bar{v} \pm \delta v = (b_0 + b_1 \bar{y}) \pm (b_1 t_{99,95\%} S_{\bar{y}})$** True

9. **The uncertainty in the $\bar{w}$ position measurement, $u_{\bar{w}}$, is the last term in the equation, $\bar{w} \pm \delta w = (c_0 + c_1 \bar{z} + c_2 \bar{z}^2) \pm ((c_1 + 2\bar{z}c_2) t_{99,95\%} S_{\bar{z}})$** True

10. **The uncertainty $u_{\bar{V}}$ in the final vector magnitude at $\bar{v}, \bar{w}$ is $\pm \left[\left(\frac{\partial V}{\partial y} u_{\bar{v}} \right)^2 + \left(\frac{\partial V}{\partial z} u_{\bar{w}} \right)^2 \right]^{1/2}$** True

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, $u_d = \pm\sqrt{2.5^2 + 4^2}$



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, the lower C_{wire} the faster the response and the higher the input impedance.

13. You should measure current with a high input impedance meter.
    a. True
    b. False, current is a flow variable and should therefore be measured with a very low impedance meter.

14. You should measure pressure with a high input impedance meter.
    a. True, pressure is an effort variable and should therefore be measured with a high impedance meter.
    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.

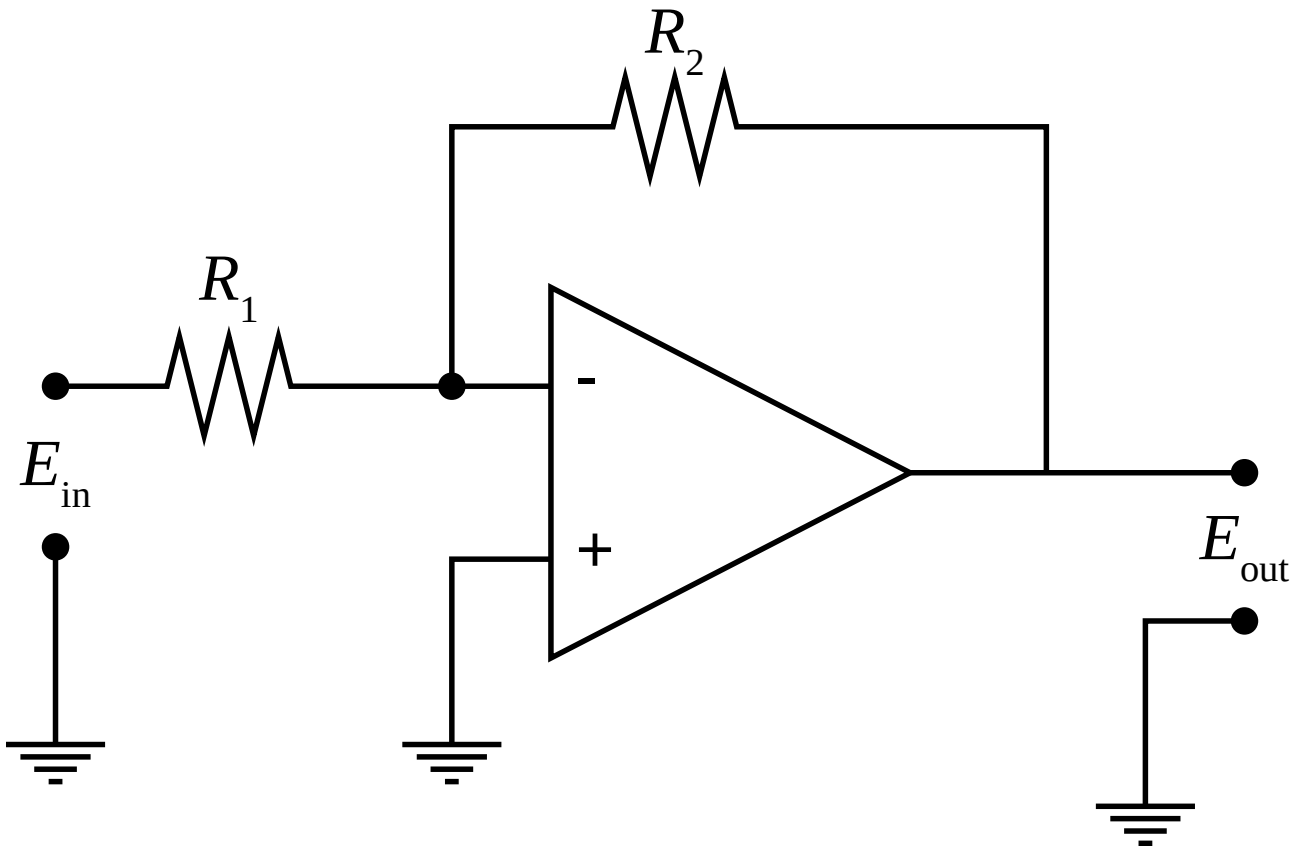
a. True

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

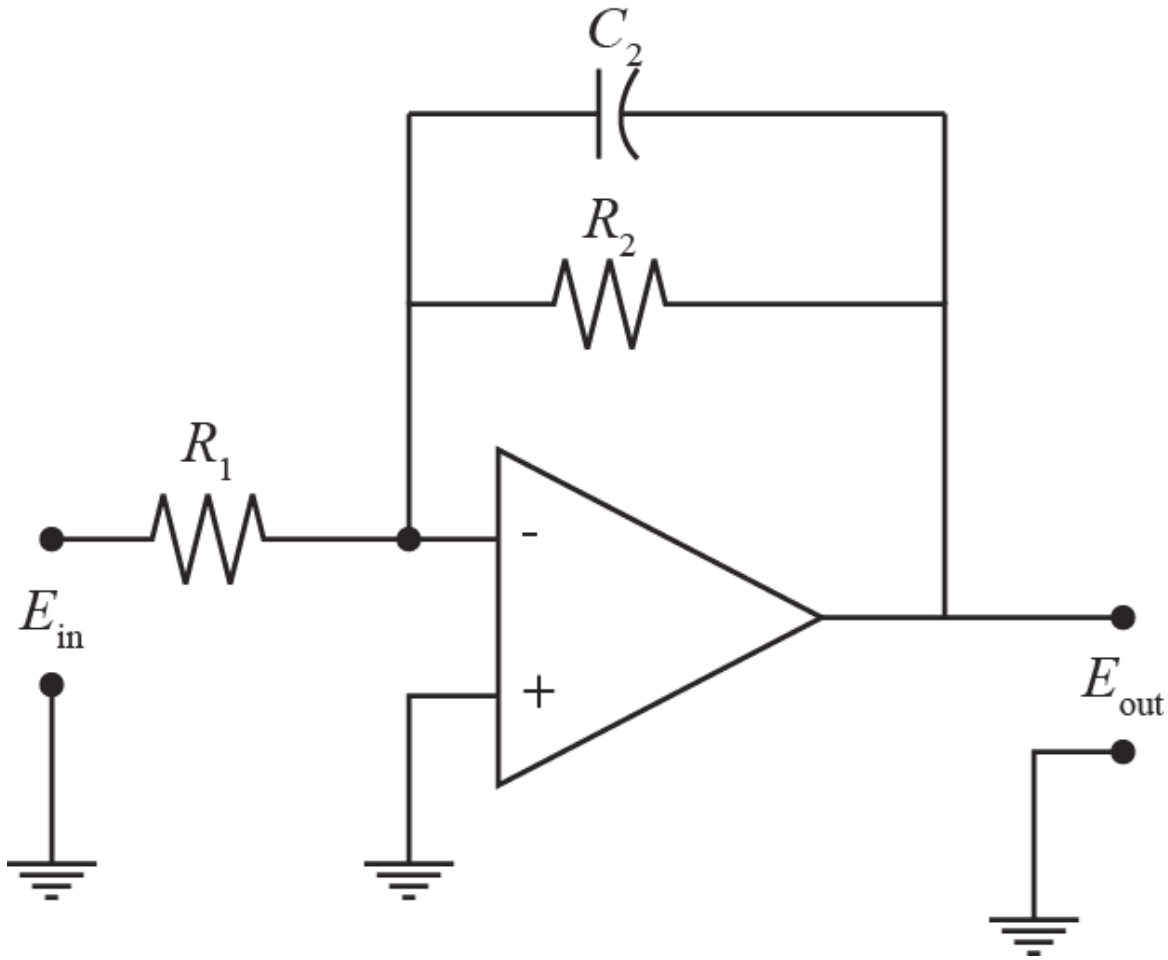
b. False

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