

### EE2301 Pre-Lab Assignment 1 Answer

1. Determine the resistance seen by the 5V source ( $R_{eq}$ ) in  $\Omega$ . Ans: 527.51
2. Determine the voltage across the 1.2k $\Omega$  resistor in V. Ans: 1.333
3. Determine the voltage across terminal Y-Z in V. Ans: 0.544
4. Determine the current through the 300 $\Omega$  resistor in mA. Ans: 8.367
5. Determine the current through the 3k $\Omega$  resistor in mA. Ans: 0.204
6. Determine the current through the 200 $\Omega$  resistor in mA. Ans: 8.367

### EE2301 Pre-Lab Assignment 2 Answer

1. If  $v_i = 0.3$  V, determine the voltage at the inverting input of the op amp **in V**.  
Ans: 0.3
2. Determine the closed-loop gain ( $v_o/v_i$ ) of the circuit. Ans: 6
3. Estimate the maximum possible value of  $v_o$  **in V**. Ans: 5
4. Determine the current supplied by the input source  $v_i$  **in mA**. Ans: 0
5. If  $R_o$  is the resistance of a Resistance Temperature Detector (RTD) at 0 °C, determine the value of  $R_o$  from the data sheet (model TD5A) **in k $\Omega$** .  
Ans: 1.854
6. From the data sheet of the RTD (model TD5A), determine the value of  $\alpha$  with **units 10<sup>-3</sup>/°C**. Ans: 3.84
7. Determine  $V_o$  **in V**. Ans: 0
8. If  $R_x = R_o$ , determine the current through  $R_D$  **in mA**. Ans: 0.5394
9. At  $T = 25$  °C, determine  $V_1$  **in V**. (Hint: pay attention to the positive/negative signs) Ans: -1.096
10. Determine the current  $I$  at  $T = 25$  °C **in mA**. Ans: 0
11. Then determine  $V_2$  when  $T = 25$  °C **in mV**. Ans: -48
12. Given  $R_2$  and  $R_1$  have the same values as in Fig 1, determine  $V_{out}$  when  $T = 25$  °C **in mV**. Ans: -432
13. Determine the slope of the graph of  $V_2$  versus  $T$  (referred to as the pre-amplified sensitivity) **with units mV/°C**. Ans: -1.92
14. Determine the slope of the graph of  $V_{out}$  versus  $T$  (referred to as the amplified sensitivity) **with units mV/°C**. Ans: -17.28

### EE2301 Pre-Lab Assignment 3 Answer

1. Referring to the circuit shown in Fig 1 in Pre-lab Assignment 3, where  $V_s = 5 \cos(2\pi f t)$  V,  $R = 1.2 \text{ k}\Omega$ ,  $C = 33 \text{ nF}$ :

For  $f = 2.5 \text{ kHz}$ , find the magnitude of  $V_C$  **in V**. Ans: 4.2456

2. For  $f = 2.5 \text{ kHz}$ , find the phase of  $V_C$  relative to  $V_{ac}$  **in degrees**. Ans: -31.8831  
3. For  $f = 2.5 \text{ kHz}$ , find the magnitude of  $V_R$  **in V**. Ans: 2.6409  
4. For  $f = 2.5 \text{ kHz}$ , find the phase of  $V_R$  relative to  $V_{ac}$  **in degrees**. Ans: 58.1169  
5. For  $f = 2.5 \text{ kHz}$ , find the current through the resistor and inductor **in mA**.

Ans: 2.2008

6. For  $f = 2.5 \text{ kHz}$ , find the phase of  $I$  relative to  $V_{ac}$  **in degrees**. Ans: 58.1169  
7. For  $f = 5 \text{ kHz}$ , find the magnitude of  $V_C$  **in V**. Ans: 3.1325  
8. For  $f = 5 \text{ kHz}$ , find the phase of  $V_C$  relative to  $V_{ac}$  **in degrees**. Ans: -51.2072  
9. For  $f = 5 \text{ kHz}$ , find the magnitude of  $V_R$  **in V**. Ans: 3.8971  
10. For  $f = 5 \text{ kHz}$ , find the phase of  $V_R$  relative to  $V_{ac}$  **in degrees**. Ans: 38.7928  
11. For  $f = 5 \text{ kHz}$ , find the current through the resistor and inductor **in mA**.

Ans: 3.2476

12. For  $f = 5 \text{ kHz}$ , find the phase of  $I$  relative to  $V_{ac}$  **in degrees**. Ans: 38.7928  
13. Referring to the circuit shown in Fig 2,  $R_1 = 2 \text{ k}\Omega$ ,  $R_2 = 3 \text{ k}\Omega$ ,  $L = 10 \text{ mH}$ ,  $C = 33 \text{ nF}$ ,  $V_{ac} = 5 \cos(2\pi f t)$  V, and  $V_{dc} = 3\text{V}$ :

For  $f = 5 \text{ kHz}$ , find the magnitude of  $V_{R2}$  **in V** at this frequency. Ans: 6.1958

14. For  $f = 5 \text{ kHz}$ , find the phase of  $V_{R2}$  relative to  $V_{ac}$  **in degrees** at this frequency. Ans: 28.4583

15. Find  $V_{R2}$  at 0 Hz (i.e. DC) **in V**. Ans: 1.8000

16. What is the average value of the resulting waveform for  $V_{R2}$  **in V**?

Ans: 1.8000

17. For  $f = 20 \text{ kHz}$ , find the magnitude of  $V_{R2}$  **in V** at this frequency. Ans: 5.6168

18. For  $f = 20 \text{ kHz}$ , find the phase of  $V_{R2}$  relative to  $V_{ac}$  **in degrees** at this frequency. Ans: -40.2394

19. Find  $V_{R2}$  at 0 Hz (i.e. DC) **in V**. Ans: 1.8000

20. What is the average value of the resulting waveform for  $V_{R2}$  **in V**? Ans: 1.8000

21. What would be the typical capacitance per unit length in these coaxial cables **in pF/m**? Ans: 100

### EE2301 Pre-Lab Assignment 4 Answer

1. Derive the frequency response of  $V_o/V_i$  Ans:  $1/(1+j\omega RC)$
2. Given that  $R = 3k\Omega$  and  $C = 6.8nF$ , calculate the cutoff frequency ( $f_c$ ), unit in Hz. Ans: 7801.7100
3. State if the circuit represents a low or high pass filter. Ans: Low pass filter
4. Derive the frequency response of  $V_o/V_i$

$$\text{Ans: } \frac{V_o}{V_i}(j\omega) = \frac{R}{R + j\omega L + \frac{1}{j\omega C}}$$

5. Given  $R = 300\Omega$ ,  $L = 10mH$  and  $C = 6.8nF$ , calculate the resonant frequency ( $f_0$ ), unit in Hz. Ans: 19300.0000