ALL PRE-LAB ANSWERS MUST BE SUBMITTED THROUGH CANVAS BEFORE SUNDAY, OCTOBER 9, 11:59 PM

CANDIDATES WITH NO SUBMISSION WILL NOT EARN ANY MARKS FOR LAB 2

Pre-Lab Assignment 2: AC Phasors

This assignment contains two pages.

Please note that **only the numerical values** to the answers for the following questions are required for submission on Canvas. **Pay attention to the units specified by each question.** There is no need to include the unit in your answer submitted on Canvas.

Preparation note: you will need most of the values derived in this assignment to compare against experimental data in Lab 1.

Phasor techniques (for Task 1)

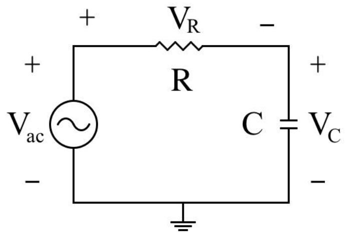

Fig 1: Circuit for questions 1 to 12

Referring to the circuit shown in Fig 1, where $V_{ac} = 5\cos(2\pi f t)$ V, R = 1.2 kΩ, C = 68 nF:

1. For f = 2.5 kHz, find the magnitude of V_C **in V**.
2. For f = 2.5 kHz, find the phase of V_C relative to V_{ac} **in degrees**.
3. For f = 2.5 kHz, find the magnitude of V_R **in V**.
4. For f = 2.5 kHz, find the phase of V_R relative to V_{ac} **in degrees**.
5. For f = 2.5 kHz, find the current through the resistor and capacitor **in mA**.
6. For f = 2.5 kHz, find the phase of I relative to V_{ac} **in degrees**.
7. For f = 5 kHz, find the magnitude of V_C **in V**.
8. For f = 5 kHz, find the phase of V_C relative to V_{ac} **in degrees**.
9. For f = 5 kHz, find the magnitude of V_R **in V**.
10. For f = 5 kHz, find the phase of V_R relative to V_{ac} **in degrees**.
11. For f = 5 kHz, find the current through the resistor and capacitor **in mA**.
12. For f = 5 kHz, find the phase of I relative to V_{ac} **in degrees**.

Remaining questions on the next page

Superposition of different frequencies (for task 2)

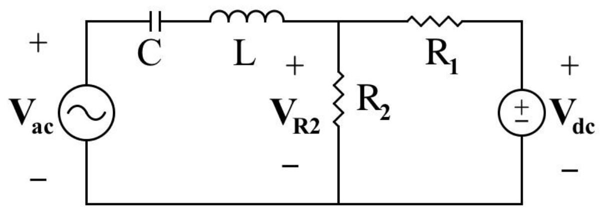

Fig 2: Circuit for questions 13 to 20

Referring to the circuit shown in Fig 2, R_1 = 1.5 kΩ, R_2 = 1 kΩ, L = 10 mH, C = 68 nF, $V_{ac} = 5\cos(2\pi ft)$ V, and V_{dc} = 3V:

13. For f = 2.5 kHz, find the magnitude of V_{R2} **in V** at this frequency.
14. For f = 2.5 kHz, find the phase of V_{R2} relative to V_{ac} **in degrees** at this frequency.
15. Find V_{R2} at 0 Hz (i.e. DC) **in V**.
16. What is the average value of the resulting waveform for V_{R2} **in V**?
17. For f = 5 kHz, find the magnitude of V_{R2} **in V** at this frequency.
18. For f = 5 kHz, find the phase of V_{R2} relative to V_{ac} **in degrees** at this frequency.
19. Find V_{R2} at 0 Hz (i.e. DC) **in V**.
20. What is the average value of the resulting waveform for V_{R2} **in V**?

Coaxial cables (for Section 3 in Report Sheet)

By examining the cross-section of a coaxial cable, you will see a pin at the core which carries the signal. The pin in the core is shielded from the external environment by the counter conductor that is grounded. The signal pin and the ground shield are isolated by a white plastic looking layer. Hence we can represent the coaxial cable by a capacitor C_P that appears between the signal line and ground (see Fig 3b in Lab Handout 3). The longer a cable, the larger will be C_P.

Do an internet search on the typical capacitance in a coaxial cable, which you will find is usually described in pF/m. Typical models of co-axial cables used in the GT lab include: RG-58U, RG58C/U, RG 058 CU and RG-58A/U.

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

☐ 25 ☐ 50 ☐ 100 ☐ 200