Submitting Candidate

Name:

Student ID:

Lab Section:

Total for Report Sheet: ______ / 16 marks

Remarks:

1. This Report Sheet accompanies the Lab Sheet for Lab 1. It accounts for about 1/2 of the total mark of Lab 2.

2. This Report Sheet should be submitted after all compulsory sections of Lab 2 have been completed. The exact submission date will be communicated to you closer to the date.

3. The marks earned in the Lab Sheet combined with the marks earned in this Report Sheet will form the total mark for Lab 2.

Section 1 (4 marks)

Section score: _______

Observations and Analysis:

What is the closest phase of the capacitor voltage relative to the current used in your circuit at 2.5 kHz and 5 kHz in Table 2? Explain your answer. [Hint: using the impedance formula of a capacitor]

For 2.5 kHz: ☐0^o ☐-45^o ☐45^o ☐-90^o ☐90^o

For 5 kHz: ☐0^o ☐-45^o ☐45^o ☐-90^o ☐90^o

Section 2 (5 marks)

Section score: _______

Observations and Analysis:

1. Sketch of waveforms for V_{ac} and V_{R2} (in DC mode). Identify the various frequency components on your graph. Note down the amplitude of the AC wave from V_{R2} and its phase relative to V_{ac}. (You can also choose to paste the plots here)

	V_{ac}	V_{R2}
@ 2.5 kHz		
@ 5 kHz		

At 2.5 kHz, V_{R2} = ________ (DC component) + _________________ (AC component)

At 5 kHz, V_{R2} = ________ (DC component) + _________________ (AC component)

2. What is the difference between your results from Lab Task 2 and Lab Task 1?

☐ No difference ☐ positive DC offset ☐ negative DC offset

Bonus: Section 3 (7 marks)

Section score: _______

Co-axial cable capacitance

3.1 The capacitance (C_L) and resistance (R_L) seen at the input terminals of the CRO are given below. These values can be found around the input socket that connects to the coaxial cable.

$C_L = 25$ pF, $R_L = 1$ MΩ

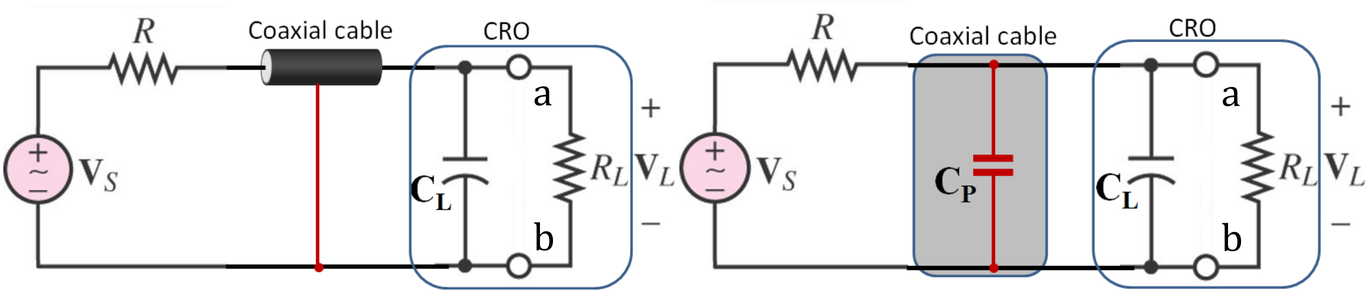

Fig 3a Fig 3b

In the circuit above, assume R = 1MΩ. We can represent the coaxial cable by a capacitor C_P as shown in Fig 3b. C_P is the total capacitance of the cable, which depends on the length of the cable and its specified capacitance per unit length (pre-lab 3). By estimating the length of the cable, provide an estimate of C_P.

3.2 **Estimate** the total capacitance of your coaxial cable (C_P) using the value found in **Pre-lab 2**. (Assuming length = 1 m)

Estimated C_P = ☐25 ☐50 ☐100 ☐200 pF

Estimated total capacitance across terminals a-b:
☐50 ☐75 ☐125 ☐225 pF

3.3 With V_S set to 5V peak, answer the following questions.

(a) At 50 Hz, the impedance across terminals a-b is determined by ☐R_L ☐($C_L + C_P$) ,
and a reasonable estimate of this impedance is
(Hint: Compare the impedances of ($C_L + C_P$) and R_L at 50 Hz. Current prefers a less resistive path.)
Show your working steps below.

(b) Based on the above estimate of impedance across a-b at 50 Hz, a reasonable estimate of V_L is
(Hint: Express V_L in terms of R, R_L, ($C_L + C_P$) and V_S. Find V_L at 50 Hz)
Show your working steps below.

(c) At 200 kHz, the impedance across terminals a-b is determined by □R_L □$(C_L + C_P)$,
and a reasonable estimate of this impedance is
(Hint: Compare the impedances of $(C_L + C_P)$ and R_L at 200 kHz. Current prefers a less resistive path.)
Show your working steps below.

(d) Based on the above estimate of impedance across a-b at 200 kHz, a reasonable estimate of V_L is
(Hint: Express V_L in terms of R, R_L, $(C_L + C_P)$ and V_S. Find V_L at 200 kHz)
Show your working steps below.