**中山大学**

**电路与电子学实验课程实验报告**



实验主题\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

实验时间\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

姓名 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

学院 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

实验日期 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **实验目的**  1.分析R、L、C取不同值时对电路的影响。  2.探究电源频率对L、C元件阻抗特性的影响。  3.探究元件的阻抗角受电源频率的影响。 |
| **实验原理**  1.阻抗元件在电路中的抗流作用与信号的频率有关。  2.阻抗、电抗、相位角之间满足关系X=Zsinφ |
| **注意事项**  1.测量电流的时候测量r的电流，因为测阻抗元件的电流可能会受到电源频率的影响。  2.接通电容时，电源频率最高不要超过2500Hz。 |
| **实验仪器、设备**  示波器1台，实验箱1台（含可调电阻，电感，电容），导线若干，数字万用表1台。 |
| **实验步骤**  1.设定电源为正弦波信号，有效值U=3V，保持不变。输出频率f=200Hz~5KHz，逐渐变化。  2.定好测量频率，并在每个频率之下分别接R、L、C三个元件，使用示波器测量UR/L/C及Ur。  3.计算各频率点的R、XL、XC的值。  4.观察各频率点的阻抗图像。  5.计算阻抗元件的实部和虚部，并测量出阻抗角φ。 |
| **仿真图纸** |
| **仿真数据表格**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 频率f（Hz） | 200Hz | 1000Hz | 1800Hz | 2500Hz | | UR | 0.99 | 0.99 | 0.99 | 0.99 | | IR | 0.00083 | 0.00083 | 0.00083 | 0.00083 | | Ur | 0.166 | 0.166 | 0.166 | 0.166 | |  |  |  |  |  | | UC | 0.99 | 0.99 | 0.99 | 0.99 | | IC | 0.00495 | 0.0028 | 0.00345 | 0.0038 | | Ur | 0.21 | 0.56 | 0.69 | 0.76 | |  |  |  |  |  | | UL | 0.99 | 0.99 | 0.99 | 0.99 | | IL | 0.00495 | 0.00475 | 0.00435 | 0.004 | | Ur | ­0.99 | 0.95 | 0.87 | 0.80 |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 频率f（Hz） | 3000Hz | 3500Hz | 4000Hz | 4500Hz | 5000Hz | | UR | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | | IR | 0.00083 | 0.00083 | 0.00083 | 0.00083 | 0.00083 | | Ur | 0.166 | 0.166 | 0.166 | 0.166 | 0.166 | |  |  |  |  |  |  | | UL | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | | IL | 0.0038 | 0.0036 | 0.0034 | 0.0032 | 0.0031 | | Ur | 0.76 | 0.72 | 0.68 | 0.64 | 0.62 | |

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| **实验数据表格**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 频率f（Hz） | 200Hz | 1000Hz | 1800Hz | 2500Hz | | UR |  |  |  |  | | IR |  |  |  |  | | Ur |  |  |  |  | |  |  |  |  |  | | UC |  |  |  |  | | IC |  |  |  |  | | Ur |  |  |  |  | |  |  |  |  |  | | UL |  |  |  |  | | IL |  |  |  |  | | Ur |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 频率f（Hz） | 3000Hz | 3500Hz | 4000Hz | 4500Hz | 5000Hz | | UR |  |  |  |  |  | | IR |  |  |  |  |  | | Ur |  |  |  |  |  | |  |  |  |  |  |  | | UL |  |  |  |  |  | | IL |  |  |  |  |  | | Ur |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | 频率 | 元件 | 阻抗（Z） | 相位角φ（°） | 实测电抗（X） | | 200Hz | R |  |  |  | |  | L |  |  |  | |  | C |  |  |  | |  |  |  |  |  | | 1000Hz | R |  |  |  | |  | L |  |  |  | |  | C |  |  |  | |  |  |  |  |  | | 1800Hz | R |  |  |  | |  | L |  |  |  | |  | C |  |  |  | |  |  |  |  |  | | 2500Hz | R |  |  |  | |  | L |  |  |  | |  | C |  |  |  | |  |  |  |  |  | | 3000Hz | R |  |  |  | |  | L |  |  |  | |  |  |  |  |  | | 3500Hz | R |  |  |  | |  | L |  |  |  | |  |  |  |  |  | | 4000Hz | R |  |  |  | |  | L |  |  |  | |  |  |  |  |  | | 4500Hz | R |  |  |  | |  | L |  |  |  | |  |  |  |  |  | | 5000Hz | R |  |  |  | |  | L |  |  |  | |
| **实验结论**  电阻的阻抗特性不随电源频率变化而变化。  电容的阻抗随电源频率变化而减小。  电感的阻抗随电源频率变化而增大。  频率越大，电容的相位角越小，电感的相位角越大。 |
| **实验数据误差分析**  电阻在实验中体现出来的阻抗特性符合预期效果，其阻值没有随电源频率的变化而变化。  而电容、电感也没有出现与预期反常的电路效果，此次实验符合预期。 |
| **实验总结和反思**  本次实验……挺简单的，就是自己设置的组别太多了，然后做实验的时候有点累23333。然后也从这个实验中更加深刻地了解到了电流超前（滞后）于电压和频率之间的关系，也亲眼看到了相位角所导致的滞后现象，还有高频之下两个波形的偏移。也是进一步对电容、电感的阻抗特性有了一个更好的了解吧。 |