

# Solutions for Laboratory 1

## EE111 Electric Circuit

### 1 Prelab

#### 1.1 Problem 1

##### 1.1.1 Answer

$$\begin{aligned}\because V &= I_1 R_1 = I_2 R_2 = 5\text{V} \\ I &= I_1 + I_2 = 100\text{mA} \\ R_1 &= 100\Omega \\ \therefore R_2 &= 100\Omega\end{aligned}$$

##### 1.1.2 Grading Criteria

Right formula, 3 points, right answer, 5 points.

#### 1.2 Problem 2

##### 1.2.1 Answer

Value
$220\text{k}\Omega \pm 1\%$
$32\text{k}\Omega \pm 1\%$
$100\Omega \pm 2\%$

##### 1.2.2 Grading Criteria

Each correct resistance is 2 points, and each correct tolerance is 1 point.

#### 1.3 Problem 3

##### 1.3.1 Answer

$20\text{k}\Omega$	$15\text{k}\Omega$	$0.047\Omega$	$8.2\Omega$
$1\text{M}\Omega$	$2.2\text{k}\Omega$	$0.050\Omega$	$8.2\Omega$

##### 1.3.2 Grading Criteria

Each correct value is 1.5 points.

#### 1.4 Problem 4

##### 1.4.1 Answer

$$\begin{aligned}\because I &= \frac{V_L}{R_L} = \frac{V}{R_L + R_S} \\ R_L &= 500\Omega \\ R_S &= 50\Omega \\ V &= 1\text{V} \\ \therefore V_L &= \frac{10}{11}\text{V} = 0.91\text{V}\end{aligned}$$

## 1.4.2 Grading Criteria

Right formula, 4 points, right answer, 6 points.

## 1.5 Problem 5

### 1.5.1 Answer

- Digital Multimeter FLUKE15B+
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Use only correct measurement category (CAT), voltage, and amperage rated probes, test leads, and adapters for the measurement.
- Measure a known voltage first to make sure that the Product operates correctly.
- Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.
- Connect the common test lead before the live test lead and remove the live test lead before the common test lead.
- Keep fingers behind the finger guards on the probes.
- Remove all probes, test leads, and accessories before the battery door is opened.
- Replace the batteries when the low battery indicator shows to prevent incorrect measurements.
- Disconnect all test leads from any hazardous voltage before switching to the LED TEST function. Refer to the LED TEST section for proper measurement technique and interpretation of results (for 18B+ only).
- To prevent possible electrical shock, fire, or personal injury, disconnect power and discharge all high-voltage capacitors before you measure resistance, continuity, capacitance, or a diode junction.
- To prevent possible electrical shock, fire or personal injury, do not use the HOLD function to measure unknown potentials. When HOLD is turned on, the display does not change when a different potential is measured.
- To prevent possible electrical shock, fire, or personal injury, remove circuit power before you connect the Product in the circuit when you measure current. Connect the Product in series with the circuit.
- Soldering Safety
- Never touch the element of the soldering iron....400 degrees centigrade!
- Hold wires to be heated with tweezers or clamps.
- Keep the cleaning sponge wet during use.
- Always return the soldering iron to its stand when not in use. Never put it down on the workbench.

- Turn unit off and unplug when not in use.
- Wear eye protection. Solder can “spit”.
- Use rosin and lead -free solders wherever possible.
- Keep cleaning solvents in dispensing bottles.
- Always wash your hands with soap and water after soldering.
- Immediate place any burns under cold water for 15 minutes.
- Report to a first aider if deep or extensive otherwise protect with a plaster (band-aid).

### 1.5.2 Grading Criteria

Each part is 4 points.

## 2 Report

### 2.1 Part One

#### 2.1.1 Answer

- about 1 or 10  $M\Omega$
- overcurrent protection
- Yes. Because the internal resistance of voltmeter is comparable to that of the oscilloscope and can not be ignored (or other reasonable answer such as the analysis of the parallel circuit)

#### 2.1.2 Grading Criteria

5point/5point/10point

### 2.2 Part Two

#### 2.2.1 Answer and Grading Criteria

a.

- Predicted value: 5 V
- Measured Value: around 5 V
- 5 points each

b.

- Predicted value:  $5 \times 10^{-3}$  A (2 points)
- Supply, resistor, and the ampere meter are conneted in in series (3 points)
- Measured Value: about 5mA (2 points)
- The ampere meter has internal resistance which can not be ignored (3 points)

**c.**

- Predicted values: 2V 0.02 A  
Measured values: about 2V about 0.02 A (2 points each)
- The influence of internal resistance of the multimeter.  
(Or the meter that is built into the supply is not accurate which make the current not exactly 20mA. Or other reasonable answers. )  
2 points

**d.**

- 10 points in total
- Each line worth 3 points.
- If there are any lines include less than 5 dots, -5 points