Physical Experiments I

Pre-lab Assignment

Experiment Title

Your Chinese Name：郑长刚
(Your UESTC Student Number：2016200302027)

Instructor: Yuanjun Guo

Teaching Assistant: Yichao Chen

Date Performed:

UESTC Student Number: 2016200302027 Email: 1558241660@qq.com Date: May 11

Score

Answers to Questions (20 points)

(1) In the following diagram (Fig. P3.1-1), a current goes through an ammeter and its accuracy grade are 50 mA and 1, respectively. What's the magnitude of the current?

From the ammeter below, I get the answer: I=30.0 (mA)

(2) Prove that the true resistant R is given approximately by the following equations. (Ammeter is outside the voltmeter)

$$R' = \frac{RR_U}{R + Ru}$$

$$R = R' \frac{R + R_U}{R_U} = R'(1 + \frac{R}{R_U})$$

When we use this method to get the result R', there are some errors (To be honest, it is wrong. Though the Ru is huge). For instance, there are some current go through the resistance in the voltmeter, which means there has current in the voltmeter. This makes our result to be the R' which is the parallel resistance of Ru and R. (The voltage we got is true with no error)

(3) Prove that the true resistant R is given by the following equations. (Ammeter is inside the voltmeter)

$$U = I(R_A + R)$$

$$\boldsymbol{R = R' - R_A = R'\left(1 - \frac{R_A}{R'}\right)}$$

If we use this method to get the result R', there are also some errors (To be honest, it is wrong definitely. Though the Ra is small). For instance, there are some voltage on the resistance in the voltmeter, which means that there have voltage which is separated to the ammeter. This makes our result to be the R' which is the serial resistance of Ra and R. (The current we got is true with no error)

(4) Compute the uncertainty in R and present the final measurement result for R.

$R = \frac{U}{I}$ = 43.377Ω

Uncertainty is :

$$\sigma_R = R\sqrt{(\frac{\sigma_U}{U})^2 + (\frac{\sigma_I}{I})^2} = 0.287\Omega$$

The final result R is : R=(43.377±0.287)Ω