Faculty of Electrical & Electronics Engineering
BEE1133 Circuit Analysis I

LABORATORY 2

Title: Nodal and Mesh Analysis

Taxonomy Level					
1. Knowledge	**2. Comprehension**	**3. Application**	**4. Analysis**	5. Synthesis	6. Evaluation
Mapping CO,PO,Domain,KI : CO2,PO2,C4,CO4,PO3,P4,CTPS4					

CO 02 : Analyze DC circuit problems using circuit theorem, nodal analysis and mesh analysis
PO 02 : (Problem Analysis) Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
C4 : Analysis

CO 04 : Construct DC and AC electric circuits to understand the concept of electrical quantities and verify circuit theorems.
PO 05: Modern Tool Usage - Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
P4 : Mechanism
CTPS4: Capable of thinking beyond the limit.

Learning Outcomes

At the end of the experiment, student should be able to:-

   a) Study node voltages and mesh currents.
   b) Apply KCL and KVL laws to the circuit.
   c) Compare calculated and measured results.

Part A

Instruction

   1. Measure the value for each resistor in Figure 1. (R_1 = 1.5 kΩ, R_2 = 1 kΩ, R_3 = 3.3 kΩ, R_4= 4.7 kΩ, R_5= 1.8 kΩ)
   2. Construct the circuit and set VS1=6 V, VS2=16 V.
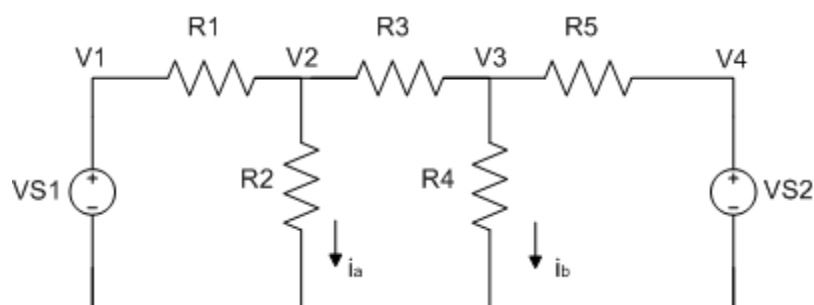   3. Measure all node voltages.

Figure 1

Node questions:

1. Set up the node equations for the circuit and solve for V_2 and V_3 using nominal values of resistances and voltage sources.
   SHOW ALL CALCULATIONS IN YOUR REPORT.
2. Compare all measured node voltages with the calculated values. Give your comments.
3. From your observation in this experiment, what are the values of V_1 and V_4? State in your report.

Part B

Instruction
1. Repeat Step 1 & 2 in part A.
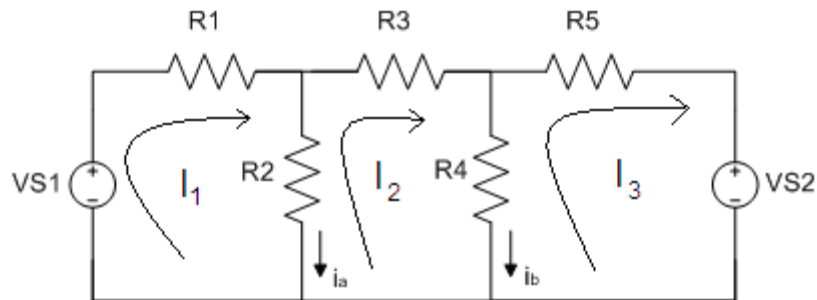2. Measure all the mesh currents designated by I_1, I_2 and I_3.

Figure 2

Mesh questions:
1. From your measured mesh currents, calculate the value of the branch currents, I_a and I_b.
2. Set up the mesh equations for the circuit and solve for I_1, I_2 and I_3 using nominal values of resistances and voltage sources.
   SHOW ALL CALCULATIONS IN YOUR REPORT.
3. Compare all measured mesh currents with the calculated values. Again give your comments whether the experiment results verify the theory of mesh analysis.
4. Calculate the power absorbed by resistors R_2 and R_4 using the currents measured in this experiment.

Laboratory Session and Submission of Report

1. Please read the lab sheet given before the laboratory session.
2. The theoretical part should be done first before the laboratory session.
3. Construct your results into table.
4. Submission of report should be written in proper language and follow the instruction in the lab sheet. (Include: objective, procedure, hand calculation (theoretical), result, questions, discussion and conclusion.
5. Submit your report with the standard front page (given in website)

References
R. L. Boylestad and G. Kousourou, "Laboratory Solutions Manual to accompany Experiments in Circuit Analysis', Pearson Prentice Hall, 2004.