Lab Report: Electrical Circuits (CSE 209)

Expt. No: 05

Title: Bias Point Detail Analysis of DC Circuit with Dependent Sources Using PSpice Schematics.

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Title: Bias Point Detail Analysis of DC Circuit with Dependent Sources Using PSpice Schematics

Objective:

l. To analyze Bias Point Detail of DC circuit with dependent source using PSpice Schematics.

Introduction:

A dependent source consists of two elements: the controlling element and the controlled element. The controlling element is either a voltage or a current and the controlled element is either a voltage or a current. There are four types of dependent sources that correspond to the four ways of choosing a controlling element and a controlled element. These four dependent sources are

- Voltage-controlled voltage source (VCVS)
- Voltage-controlled current source (VCCS)
- Current-controlled voltage source (CCVS)
- Current-controlled current source (CCCS)

In PSpice Schematics, the dependent sources can be found in the parts list. Click on the get parts list. VCVS is represented by the letter E, VCCS is represented by the letter G, CCVS is represented by the letter H and CCCS is represented by the letter F in PSpice. These parts have the shapes shown in Figure l. The circular box represents the source and the other terminals are for the controlling parameter.

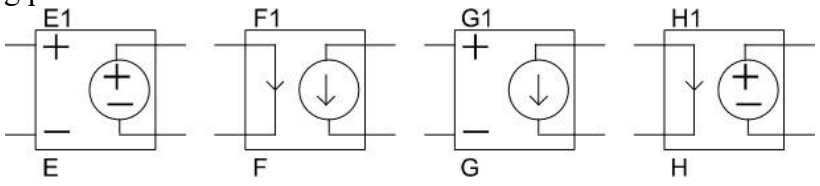


Figure of circuit with VCVS (Voltage-controlled voltage source):

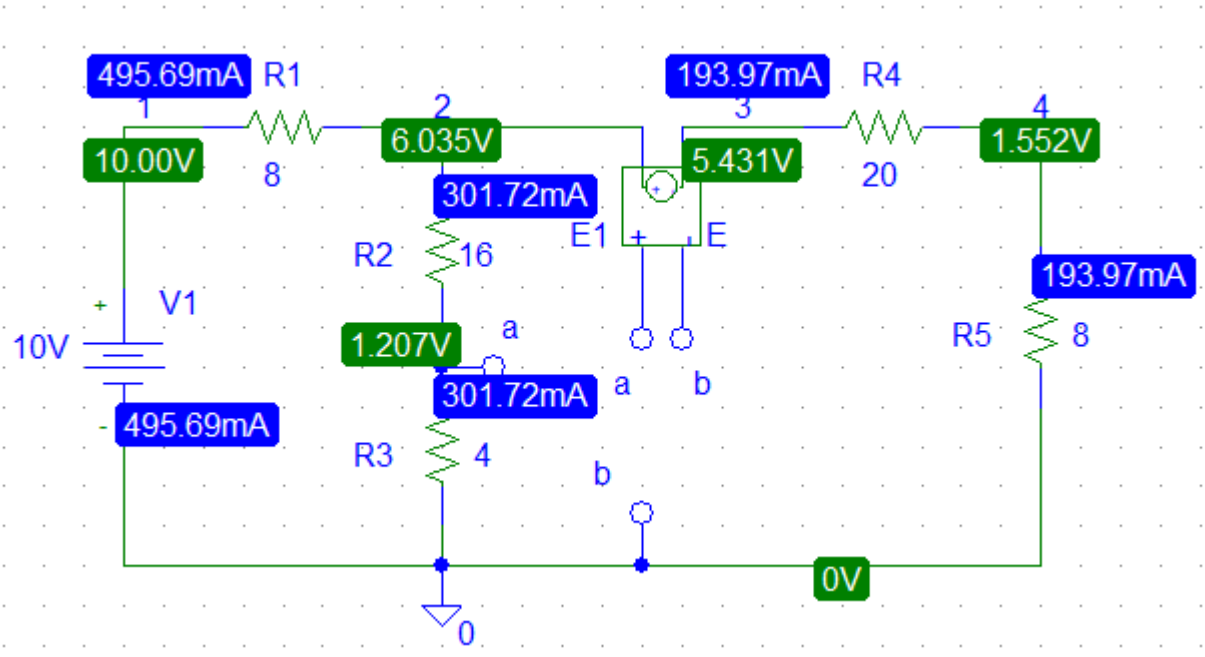


Figure of circuit with VCCS (Voltage-controlled current source):

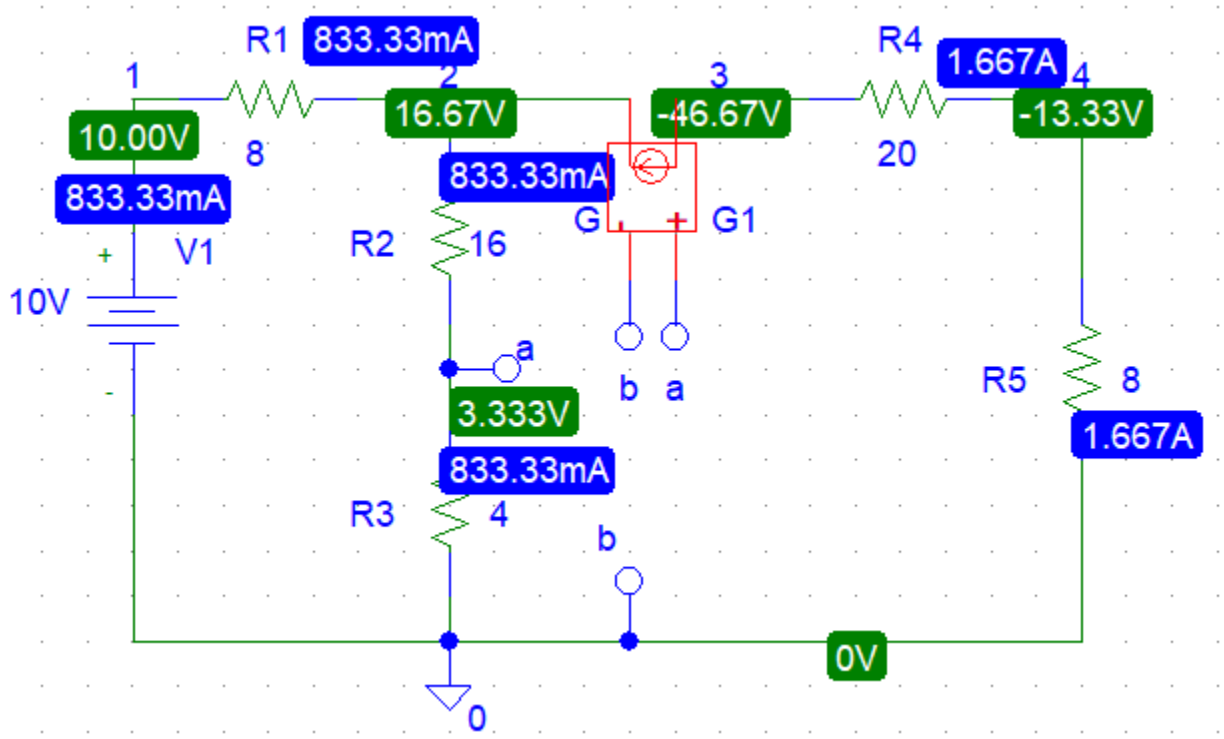


Figure of circuit with CCVS (Current-controlled voltage source):

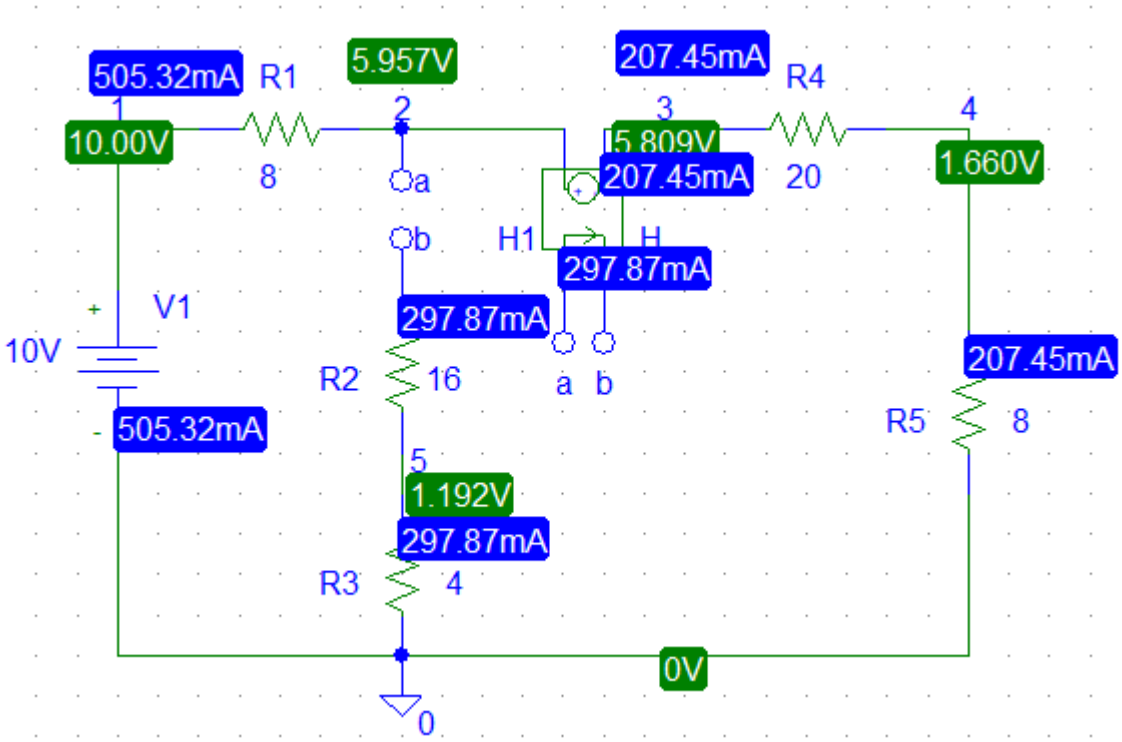


Figure of circuit with CCCS (Current-controlled current source):

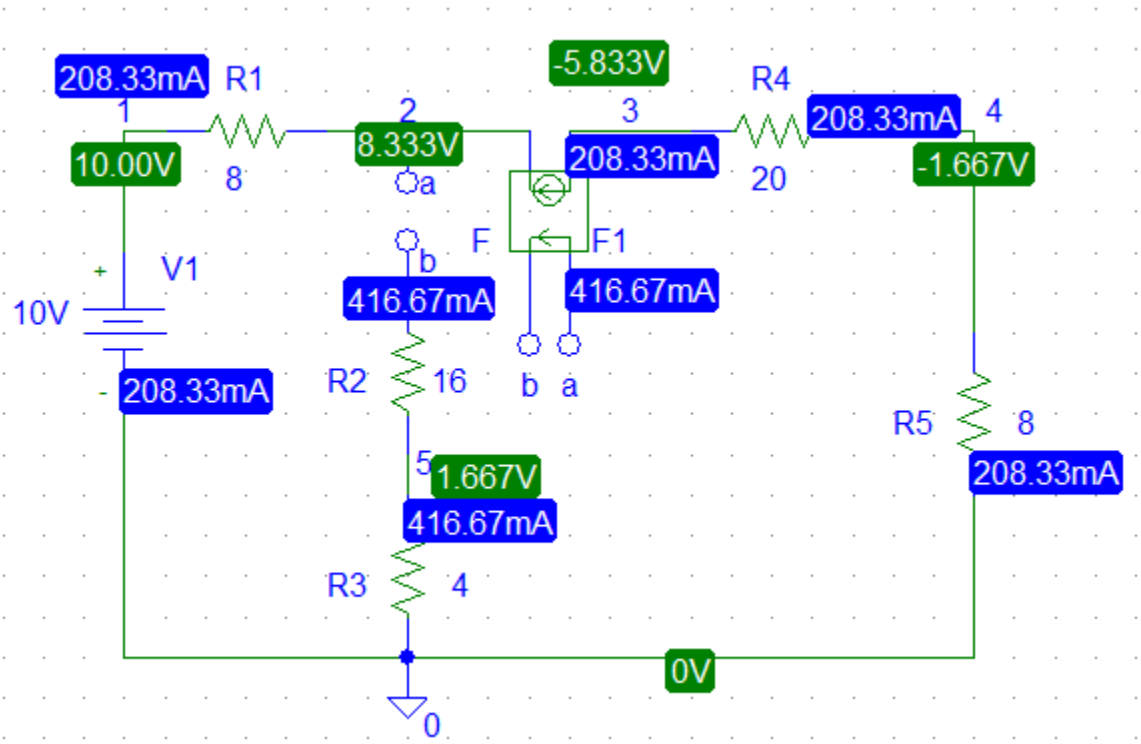
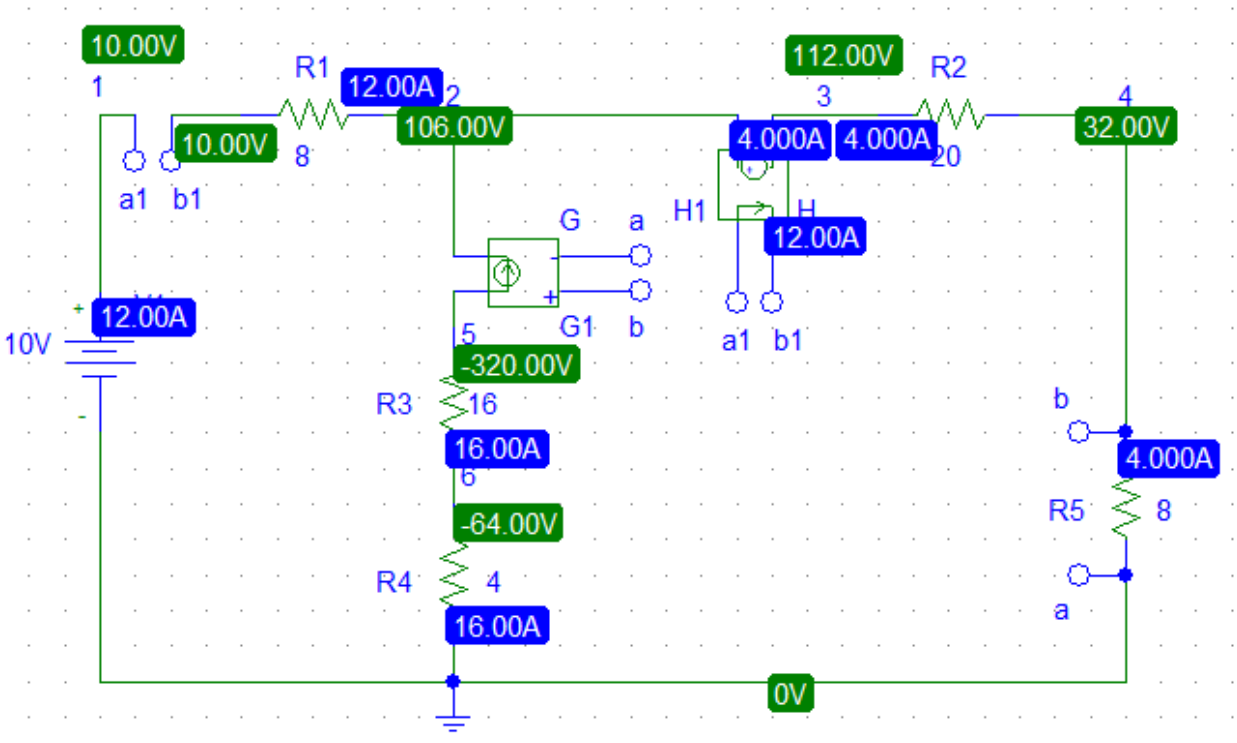


Figure of circuit with VCCS and CCVS:



Post lab question 01 solution:

Let,

$I_s = I_1$

$V_{ab} = 8I_2$

Applying KCL at node 2,

$I_1 + 0.5V_{ab} = I_2$

Or, $0.5*8I_2 = I_2 - I_1$

$\therefore 3I_2 + I_1 = 0$**……**(i)

Applying KVL at super mesh,

$10-8I_1-0.5I_1-28I_2=0$

$\therefore 8.5I_1+28I_2=10$**…….**(ii)

Solving equation (i) and (ii) we get,

$I_1 = I_s = -12A$

$I_2 = 4A$

So,

$V_{ab} = 8I_2 = 8*4V = 32V$

Current passing through VCCS $= 0.5V_{ab} = 0.5*32A = 16A$

Let at node 2 voltage $= V_2$

Applying KCL and Ohm's law at node 2,

$\frac{V2-10}{8} + \frac{V2-0.5Is}{28} = 16$

$\therefore V_2 = 106V$

At node 3,

$V_3 = 4*28V = 112V$

At node 5,

$V_5 = (-16)*20V = -320V$

At node 6,

$V_6 = (-16)*4V = -64V$

Post lab question 02 solution:

Comparison:

Theoretical value	Pspice Simulated Value
$IS = -12A$	$IS = -12A$
$I_2 = 4A$	$I_2 = 4A$
Current passing through VCCS= $16A$	Current passing through VCCS= $16A$
$V1 = 10V$	$V1 = 10V$
$V2 = 106V$	$V2 = 106V$
$V3 = 112V$	$V3 = 112V$
$Vab = 32V$	$Vab = 32V$
$V5 = -320V$	$V5 = -320V$
$V6 = -64V$	$V6 = -64V$