電路學(EE2210)第一次隨堂考

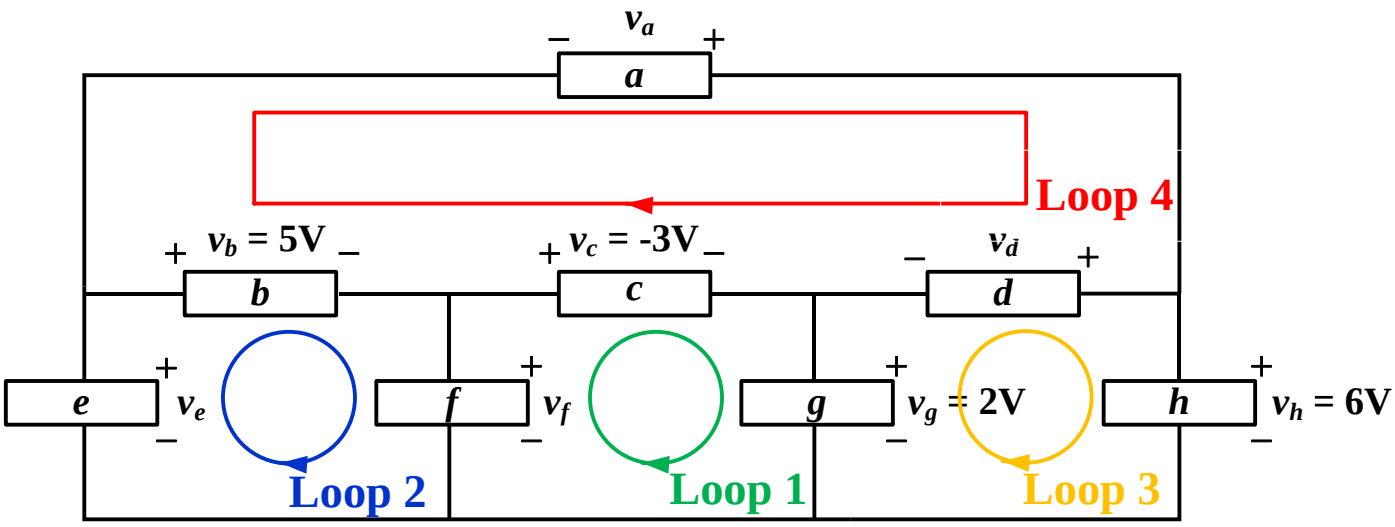
2016年9月26日
時間：10 分鐘
Close Book

學號：_____

姓名：_____

For the circuit as shown below, there are six elements which observe the ***Associated Variables Convention***. Among the eight elements, the voltages for four elements are given on the figure. The current for element *a* is i_a = -3A, for element *e* is i_e = -6A, for element *d* is i_d = 2A, and for element *f* is i_f = 4A. By using the KVL and KCL, please find

(i) the voltages of element *a* and *e* (v_a and v_e),
(ii) the currents of element *c* and *g* (i_c and i_g),
(iii) the power of element *e* (p_e).



Solutions:

(i)

Applying KVL to the two loops:

Loop 1: $v_c + v_g - v_f = 0$

$\Rightarrow -3\text{V} + 2\text{V} - v_f = 0$

$\Rightarrow v_f = -1\text{V}$

Loop 2: $v_b + v_f - v_e = 0$

$\Rightarrow 5\text{V} - 1\text{V} - v_e = 0$

$\Rightarrow v_e = 4\text{V}$

Loop 3: $-v_d + v_h - v_g = 0$

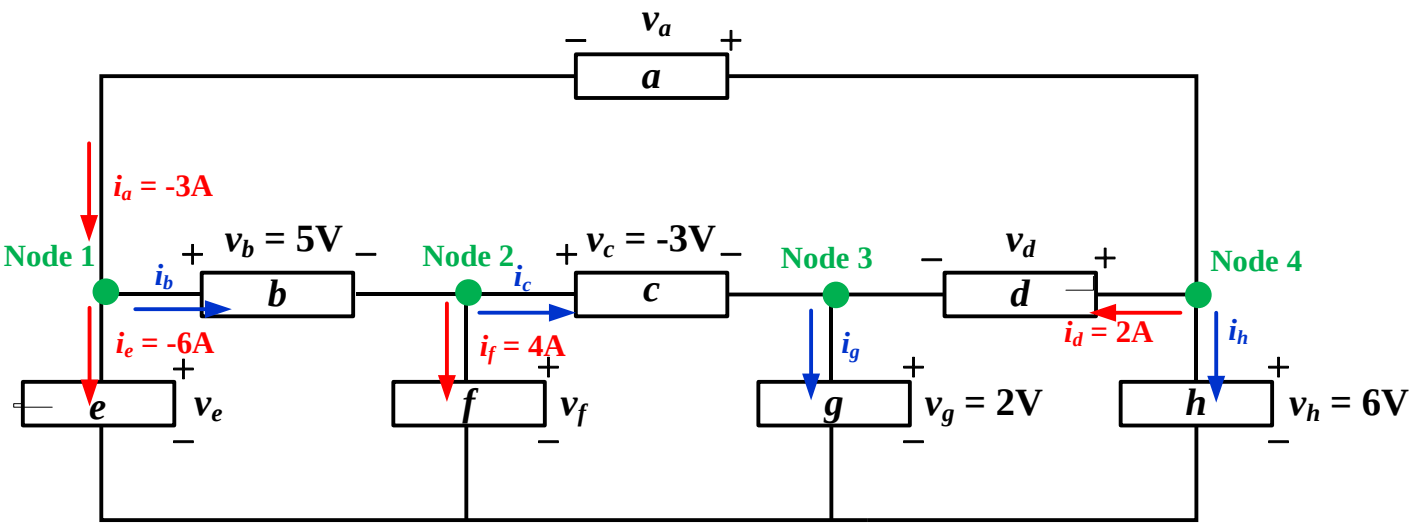
$\Rightarrow -v_d + 6\text{V} - 2\text{V} = 0$

$\Rightarrow v_d = 4\text{V}$

Loop 4: $-v_a + v_d - v_c - v_b = 0$

$\Rightarrow -v_a + 4\text{V} + 3\text{V} - 5\text{V} = 0$

$\Rightarrow v_a = 2\text{V}$



(ii)

Applying KCL to the two nodes:

Node 1: $i_a - i_e - i_b = 0$

$\Rightarrow -3\text{A} - (-6\text{A}) - i_b = 0$

$\Rightarrow i_b = 3\text{A}$

Node 2: $i_b - i_c - i_f = 0$

$\Rightarrow 3\text{A} - i_c - 4\text{A} = 0$

$\Rightarrow i_c = -1\text{A}$

Node 3: $i_c + i_d - i_g = 0$

$\Rightarrow -1\text{A} + 2\text{A} - i_g = 0$

$\Rightarrow i_g = 1\text{A}$

Node 4: $-i_d - i_a - i_h = 0$

$\Rightarrow -2\text{A} - (-3\text{A}) - i_h = 0$

$\Rightarrow i_h = 1\text{A}$

(iii)

$p_e = v_e \times i_e = 4 \times (-6) = -24\text{W}$

$p = v \times i$

$p_a = 2 \times (-3) = -6\text{W}$

$p_b = 5 \times 3 = 15\text{W}$

$p_c = (-3) \times (-1) = 3\text{W}$

$p_d = 4 \times 2 = 8\text{W}$

$p_e = 4 \times (-6) = -24\text{W}$

$p_f = (-1) \times 4 = -4\text{W}$

$p_g = 2 \times 1 = 2\text{W}$

$p_h = 6 \times 1 = 6\text{W}$

$p_a + p_b + p_c + p_d + p_e + p_f + p_g + p_h = 0\text{W}$ (Power conservation in this circuit.)

(i) v_a = 2V, v_e = 4V,

(ii) i_c = -1A, i_g = 1A,

(iii) p_e = -24W.