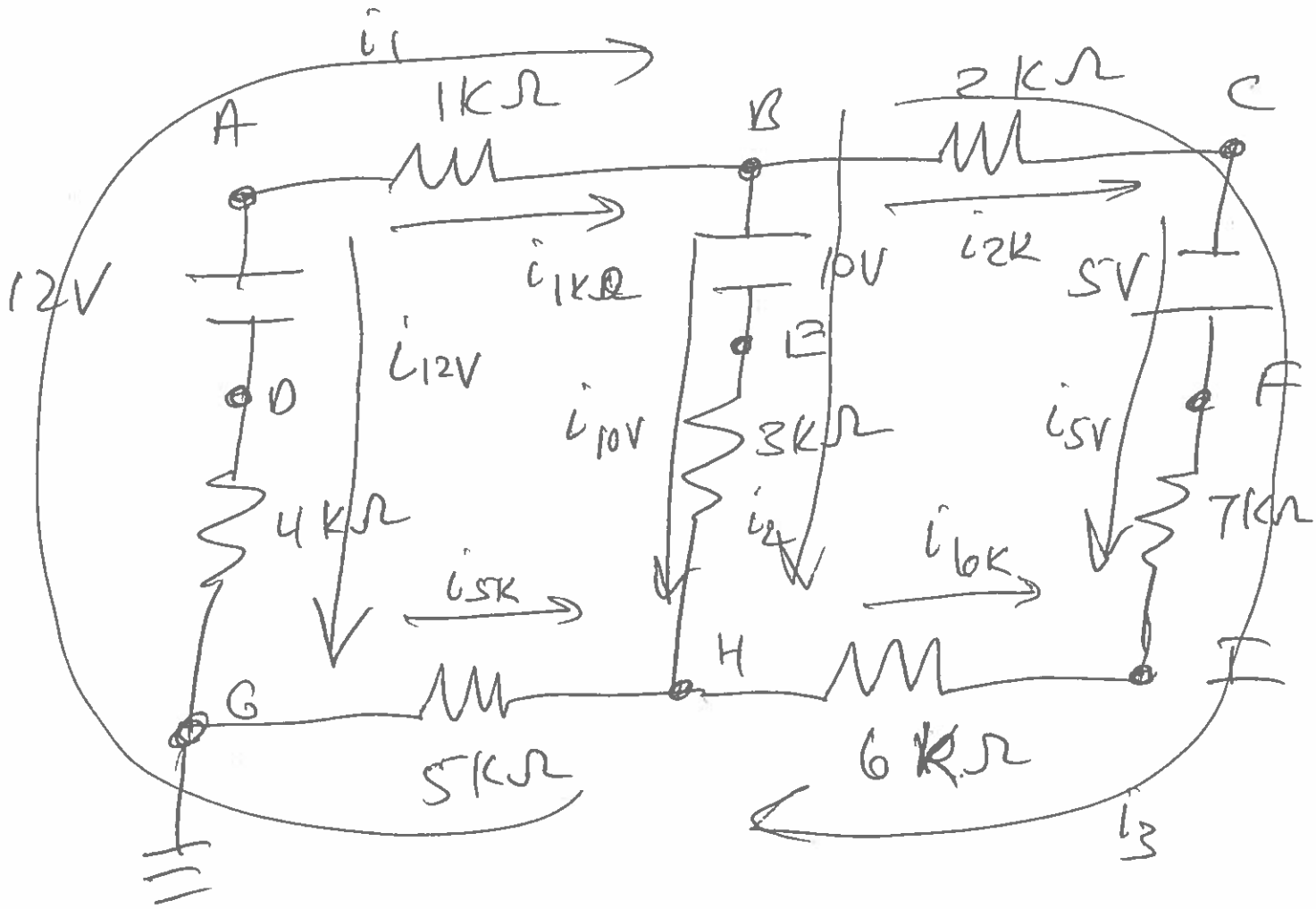

Currents to right or down Assumed > 0

Currents to left or up Assumed < 0

$$i_{1K\Omega} = -i_{12V} = -i_{5K} = i_1$$

$$i_{2K\Omega} = i_{5V} = -i_{6K} = i_3$$

$$i_{10V} = i_2$$

Need 1 Junction 2 loops

Junction at point B $\Rightarrow \boxed{i_1 = i_2 + i_3}$

Left loop Go clockwise start at A

$$-i_1(1k\Omega) - 10V - i_2(3k\Omega) - i_1(5k\Omega) - i_1(4k\Omega) + 12V = 0$$

Right loop Go clockwise start at B

$$-i_3(2k\Omega) + 5V - i_3(7k\Omega) - i_3(6k\Omega) + i_2(3k\Omega) + 10V = 0$$

$$[A]I = V$$

$$i_1 - i_2 - i_3 = 0$$

$$i_1(1k\Omega + 5k\Omega + 4k\Omega) + i_2(3k\Omega) = 12V - 10V$$

$$i_2(-3k\Omega) + i_3(2k\Omega + 7k\Omega + 6k\Omega) = 10V + 5V$$

$$A = \begin{matrix} 1 & -1 & -1 \\ (1+5+4) & (3) & 0 \\ 0 & -3 & (2+7+6) \end{matrix}$$

$$V = [0 \quad (12-10) \quad (10+5)]$$

MATLAB solves

```
%Program to solve PH 320 Lecture Example
%version 2021-02-05 DW Donovan
clear all;

RR = [1 -1 -1;
    (1 + 5 + 4) 3 0;
    0 -3 (2 + 7 + 6)];
VV = [0 (12 - 10) (10 + 5)]';
II = RR\VV;
i1 = II(1);
i2 = II(2);
i3 = II(3);

i1K = i1;
i12V = -i1;
i5K = -i1;
i2K = i3;
i5V = i3;
i6K = -i3;
i10V = i2;

VG = 0;
VD = VG - i1*4;
VA = VD + 12;
VB = VA - i1*1;
VH = VG + i1*5;
VE = VH + i2*3;
VB2 = VE + 10;
VC = VB -i3*2;
VF = VC + 5;
VI = VF - i3*7;
VI2 = VH +i3*6;

VAB = VA - VB;
VBC = VB - VC;

ANS = {' Current' 'Value' 'Voltage' 'Value';
    'i1 is ' [num2str(i1) ' mA']    'VA is' [num2str(VA) '
V'];
    'i2 is ' [num2str(i2) ' mA']    'VB is' [num2str(VB) '
V'];
    'i3 is ' [num2str(i3) ' mA']    'VC is' [num2str(VC) '
V'];
```

```
    'i12V is' [num2str(i12V) ' mA'] 'VD is' [num2str(VD) '
V'];
    'i10V is' [num2str(i10V) ' mA'] 'VE is' [num2str(VE) '
V'];
    'i5V is' [num2str(i5V) ' mA']   'VF is' [num2str(VF) '
V'];
    'i1K is' [num2str(i1K) ' mA']   'VG is' [num2str(VG) '
V'];
    'i2K is' [num2str(i2K) ' mA']   'VH is' [num2str(VH) '
V'];
    'i5K is' [num2str(i5K) ' mA']   'VI is' [num2str(VI) '
V'];
    'i6K is' [num2str(i6K) ' mA']   'VAB is' [num2str(VAB)
' V'];
   '       ' '                  '  'VBC is' [num2str(VBC)
' V']};

 ANS

%{
ANS =

    ' Current'    'Value'                  'Voltage'
'Value'
    'i1 is '      '0.36 mA'                'VA is'
'10.56 V'
    'i2 is '      '-0.53333 mA'            'VB is'
'10.2 V'
    'i3 is '      '0.89333 mA'             'VC is'
'8.4133 V'
    'i12V is'     '-0.36 mA'               'VD is'      '-
1.44 V'
    'i10V is'     '-0.53333 mA'            'VE is'
'0.2 V'
    'i5V is'      '0.89333 mA'             'VF is'
'13.4133 V'
    'i1K is'      '0.36 mA'                'VG is'      '0
V'
    'i2K is'      '0.89333 mA'             'VH is'
'1.8 V'
    'i5K is'      '-0.36 mA'               'VI is'
'7.16 V'
    'i6K is'      '-0.89333 mA'            'VAB is'
'0.36 V'
```

```
    '       '     '                       '    'VBC is'
'1.7867 V'
%}
```