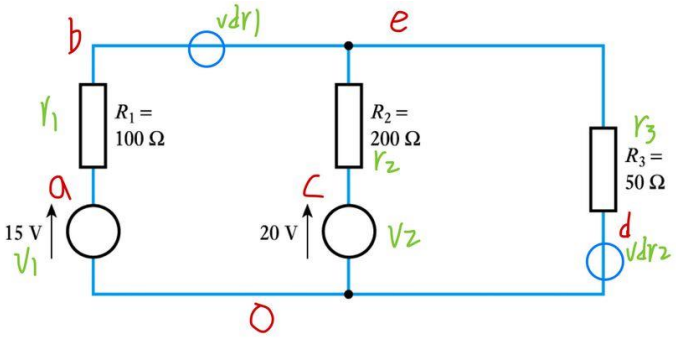
一、circuit analysis

1. L06:P16.sp

(1) circuit diagram



(2) code

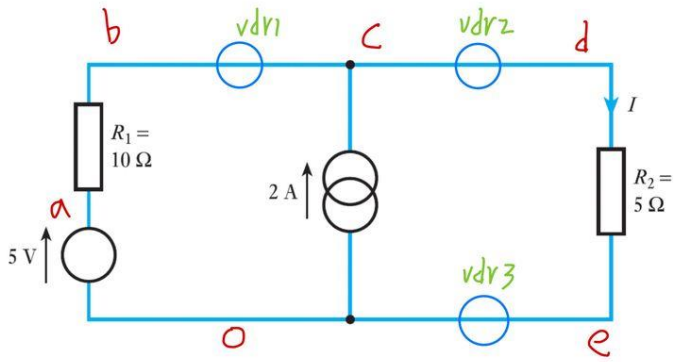
```
v1 a 0 dc 15
r1 b a 100
vdr1 e b dc 0
v2 c 0 dc 20
vdr2 d 0 dc 0
r2 e c 200
r3 e d 50
.dc v1 15 15 1
.dc v2 20 20 1
.print dc v(a) v(b) v(c) v(d)
.print dc i(v1) i(vdr1) i(v2) i(vdr2)
```

(3) analysis results

```
                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(b)            v(c)
--------------------------------------------------------------------------------
0       1.500000e+01    1.500000e+01    7.142857e+00    2.000000e+01

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(d)
--------------------------------------------------------------------------------
0       1.500000e+01    0.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(b)            v(c)
--------------------------------------------------------------------------------
0       2.000000e+01    1.500000e+01    7.142857e+00    2.000000e+01

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(d)
--------------------------------------------------------------------------------
0       2.000000e+01    0.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     v2#branch
--------------------------------------------------------------------------------
0       1.500000e+01    -7.85714e-02    -7.85714e-02    -6.42857e-02

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr2#branch
--------------------------------------------------------------------------------
0       1.500000e+01    1.428571e-01

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     v2#branch
--------------------------------------------------------------------------------
0       2.000000e+01    -7.85714e-02    -7.85714e-02    -6.42857e-02

                                DC transfer characteristic  Tue Apr 11 20:05:45  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr2#branch
--------------------------------------------------------------------------------
0       2.000000e+01    1.428571e-01
```

2. L06:P20.sp

(1) circuit diagram



(2) code

```
v1 a 0 dc 5
r1 b a 10
vdr1 c b dc 0
i1 c 0 dc 2
vdr2 d c dc 0
r2 e d 5
vdr3 e 0 dc 0
.dc v1 5 5 1
.dc i1 2 2 1
.print dc v(a) v(a,b) v(b,c) v(c) v(c,d) v(d,e) v(e)
.print dc i(v1) i(vdr1) i(vdr2) i(vdr3)
.end
```

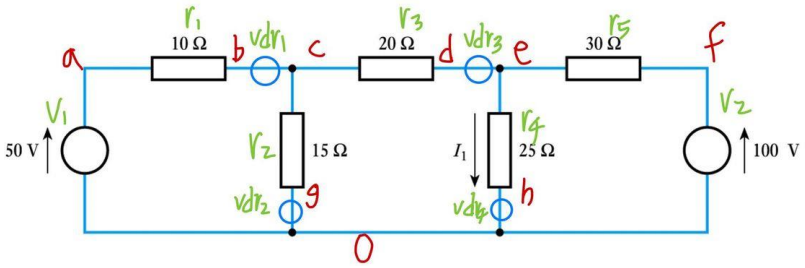
(3) analysis results

```
                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(a)-v(b)       v(b)-v(c)
--------------------------------------------------------------------------------
0       5.000000e+00    5.000000e+00    1.000000e+01    0.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(c)            v(c)-v(d)       v(d)-v(e)
--------------------------------------------------------------------------------
0       5.000000e+00    -5.00000e+00    0.000000e+00    -5.00000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(e)
--------------------------------------------------------------------------------
0       5.000000e+00    0.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   i-sweep         v(a)            v(a)-v(b)       v(b)-v(c)
--------------------------------------------------------------------------------
0       2.000000e+00    5.000000e+00    1.000000e+01    0.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   i-sweep         v(c)            v(c)-v(d)       v(d)-v(e)
--------------------------------------------------------------------------------
0       2.000000e+00    -5.00000e+00    0.000000e+00    -5.00000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   i-sweep         v(e)
--------------------------------------------------------------------------------
0       2.000000e+00    0.000000e+00
```

```
                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     vdr2#branch
--------------------------------------------------------------------------------
0       5.000000e+00    -1.00000e+00    -1.00000e+00    1.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr3#branch
--------------------------------------------------------------------------------
0       5.000000e+00    -1.00000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   i-sweep         v1#branch       vdr1#branch     vdr2#branch
--------------------------------------------------------------------------------
0       2.000000e+00    -1.00000e+00    -1.00000e+00    1.000000e+00

                                DC transfer characteristic  Tue Apr 11 20:07:02  2023
--------------------------------------------------------------------------------
Index   i-sweep         vdr3#branch
--------------------------------------------------------------------------------
0       2.000000e+00    -1.00000e+00
```

3. L06:P22.sp

(1) circuit diagram



(2) code

```
v1 a 0 dc 50
r1 b a 10
vdr1 c b dc 0
r2 g c 15
vdr2 g 0 dc 0
r3 d c 20
vdr3 e d dc 0
r4 h e 25
vdr4 h 0 dc 0
r5 f e 30
v2 f 0 dc 100
.dc v1 50 50 1
.dc v2 100 100 1
.print dc  v(a) v(a,b) v(c,g) v(c,d) v(e,h)  v(e,f) v(f)
.print dc i(v1) i(vdr1) i(vdr2) i(vdr3) i(vdr4) i(v2)
.end
```

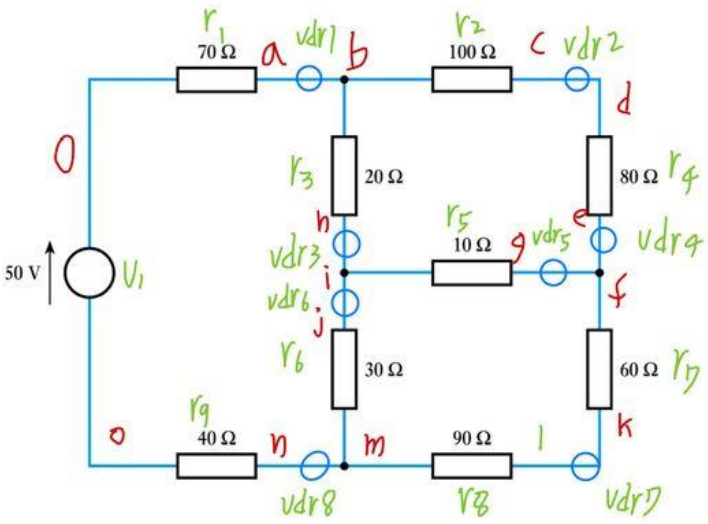
(3) analysis results

```
                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(a)-v(b)       v(c)-v(g)
--------------------------------------------------------------------------------
0       5.000000e+01    5.000000e+01    1.766055e+01    3.233945e+01

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(c)-v(d)       v(e)-v(h)       v(e)-v(f)
--------------------------------------------------------------------------------
0       5.000000e+01    -7.79817e+00    4.013761e+01    -5.98624e+01

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(f)
--------------------------------------------------------------------------------
0       5.000000e+01    1.000000e+02

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(a)-v(b)       v(c)-v(g)
--------------------------------------------------------------------------------
0       1.000000e+02    5.000000e+01    1.766055e+01    3.233945e+01

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(c)-v(d)       v(e)-v(h)       v(e)-v(f)
--------------------------------------------------------------------------------
0       1.000000e+02    -7.79817e+00    4.013761e+01    -5.98624e+01

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(f)
--------------------------------------------------------------------------------
0       1.000000e+02    1.000000e+02
```

```
                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     vdr2#branch
--------------------------------------------------------------------------------
0       5.000000e+01    -1.76606e+00    -1.76606e+00    2.155963e+00

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr3#branch     vdr4#branch     v2#branch
--------------------------------------------------------------------------------
0       5.000000e+01    3.899083e-01    1.605505e+00    -1.99541e+00

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     vdr2#branch
--------------------------------------------------------------------------------
0       1.000000e+02    -1.76606e+00    -1.76606e+00    2.155963e+00

                                DC transfer characteristic  Tue Apr 11 20:08:46  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr3#branch     vdr4#branch     v2#branch
--------------------------------------------------------------------------------
0       1.000000e+02    3.899083e-01    1.605505e+00    -1.99541e+00
```

4. L06:P26.sp

(1) circuit diagram



(2) code

```
v1 0 o dc 50
r1 a 0 70
vdr1 b a dc 0
r2 c b 100
r3 h b 20
vdr2 d c dc 0
r4 e d 80
vdr3 i h dc 0
vdr4 f e dc 0
vdr5 g f dc 0
r5 i g 10
vdr6 j i dc 0
r6 m j 30
r7 k f 60
vdr7 l k dc 0
r8 m l 90
vdr8 n m dc 0
r9 o n 40
.dc v1 50 50 1
.print dc v(a) v(b,c) v(b,h) v(d,e) v(g,i) v(j,m) v(f,k) v(l,m) v(n,o)
.print dc i(v1) i(vdr1) i(vdr2) i(vdr3) i(vdr4) i(vdr5) i(vdr6) i(vdr7) i(vdr8)
```

(3) analysis results

```
                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(a)            v(b)-v(c)       v(b)-v(h)
--------------------------------------------------------------------------------
0       5.000000e+01    -2.28698e+01    3.365621e+00    5.861107e+00


                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(d)-v(e)       v(g)-v(i)       v(j)-v(m)
--------------------------------------------------------------------------------
0       5.000000e+01    2.692497e+00    -1.97012e-01    8.200624e+00


                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         v(f)-v(k)       v(l)-v(m)       v(n)-v(o)
--------------------------------------------------------------------------------
0       5.000000e+01    3.201445e+00    4.802167e+00    1.306846e+01


                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         v1#branch       vdr1#branch     vdr2#branch
--------------------------------------------------------------------------------
0       5.000000e+01    -3.26712e-01    -3.26712e-01    -3.36562e-02


                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr3#branch     vdr4#branch     vdr5#branch
--------------------------------------------------------------------------------
0       5.000000e+01    -2.93055e-01    -3.36562e-02    1.970120e-02


                                    DC transfer characteristic  Tue Apr 11 20:10:34  2023
--------------------------------------------------------------------------------
Index   v-sweep         vdr6#branch     vdr7#branch     vdr8#branch
--------------------------------------------------------------------------------
0       5.000000e+01    -2.73354e-01    -5.33574e-02    -3.26712e-01
```

二、心得

At the beginning, I used the code uploaded by the teacher to study a little bit, but when I typed it for the first time, I still forgot that the first line needs a space. After a long time, I asked Moodle for help. Although I knew the first line needs a space by watching video, I still made this initial mistake when I typed it for the first time.

Gradually, I programmed more fast. I can write the code in the shorter time. Before programming circuit diagram, I am used to marking every elements and every circuits int circuit diagram because it can clarify how to write and make it easier to program.

I become more proficient in programming the electric circuit. I will also have improvement in the future, too.