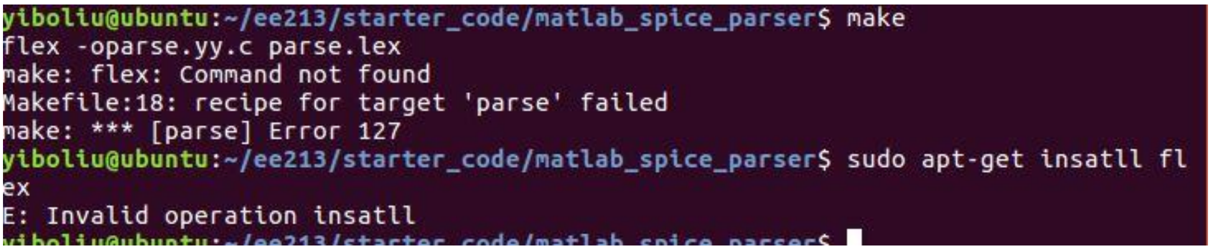
Part1. Download files from github and finish the code.

Part2. Compile under linux.(My platform is Ubuntu-16.04.3-amd64.)

1. Install vim: sudo apt-get install vim
2. put all code file uder /ee213， then open a terminal under the path: ee213/starter_code/matlab_spice_parser,
   Input in the terminal: make

Failed:



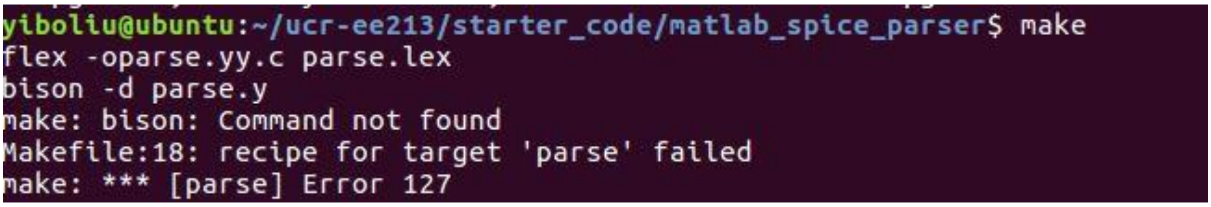
```
yiboliu@ubuntu:~/ee213/starter_code/matlab_spice_parser$ make
flex -oparse.yy.c parse.lex
make: flex: Command not found
Makefile:18: recipe for target 'parse' failed
make: *** [parse] Error 127
yiboliu@ubuntu:~/ee213/starter_code/matlab_spice_parser$ sudo apt-get insatll fl
ex
E: Invalid operation insatll
yiboliu@ubuntu:~/ee213/starter_code/matlab_spice_parser$
```

Follow the error information, install flex, failed.(sudo apt-get install flex)

Under Reference 1: https://askubuntu.com/questions/859125/make-flex-command-not-found
I edit the system source file and installed flex.

3. Under path: ee213/starter_code/matlab_spice_parser,
   open terminal and input: make

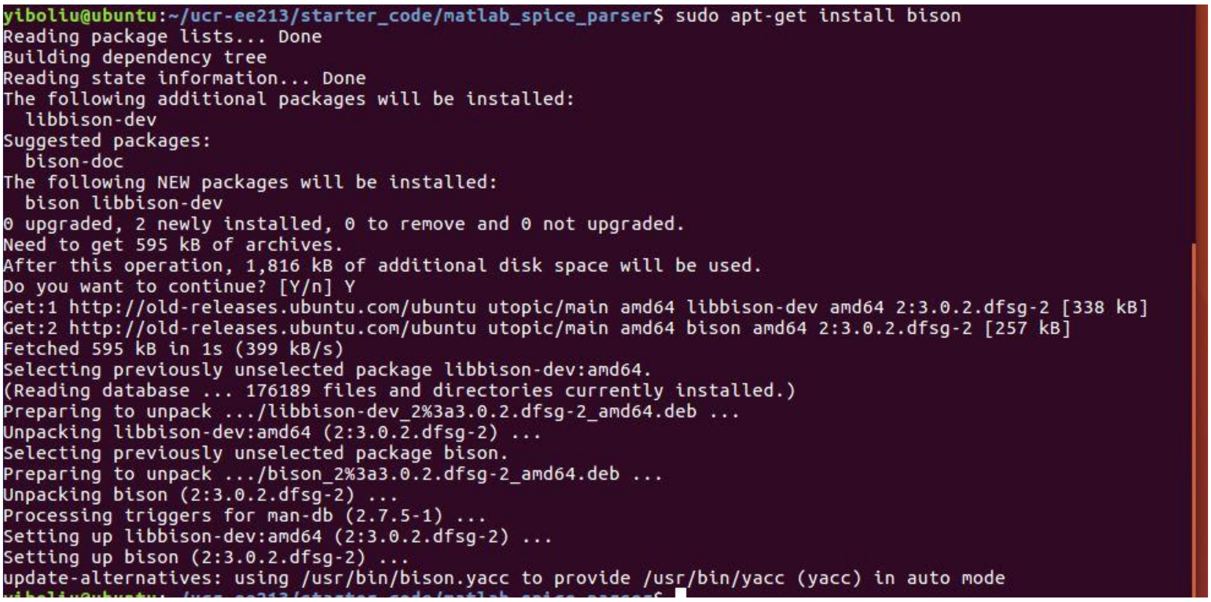
Compile Failed:



```
yiboliu@ubuntu:~/ucr-ee213/starter_code/matlab_spice_parser$ make
flex -oparse.yy.c parse.lex
bison -d parse.y
make: bison: Command not found
Makefile:18: recipe for target 'parse' failed
make: *** [parse] Error 127
```

Based on the error information, need to install: bison

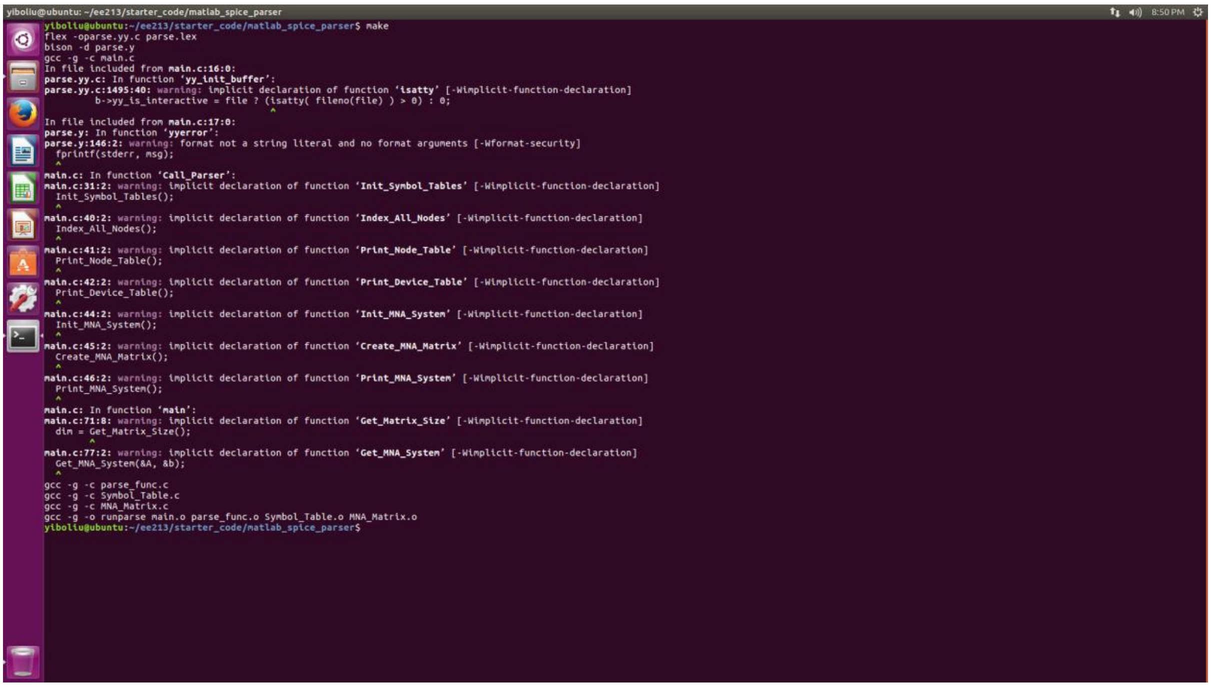
4. In the terminal , input: sudo apt-get install bison



```
yiboliu@ubuntu:~/ucr-ee213/starter_code/matlab_spice_parser$ sudo apt-get install bison
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libbison-dev
Suggested packages:
  bison-doc
The following NEW packages will be installed:
  bison libbison-dev
0 upgraded, 2 newly installed, 0 to remove and 0 not upgraded.
Need to get 595 kB of archives.
After this operation, 1,816 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://old-releases.ubuntu.com/ubuntu utopic/main amd64 libbison-dev amd64 2:3.0.2.dfsg-2 [338 kB]
Get:2 http://old-releases.ubuntu.com/ubuntu utopic/main amd64 bison amd64 2:3.0.2.dfsg-2 [257 kB]
Fetched 595 kB in 1s (399 kB/s)
Selecting previously unselected package libbison-dev:amd64.
(Reading database ... 176189 files and directories currently installed.)
Preparing to unpack .../libbison-dev_2%3a3.0.2.dfsg-2_amd64.deb ...
Unpacking libbison-dev:amd64 (2:3.0.2.dfsg-2) ...
Selecting previously unselected package bison.
Preparing to unpack .../bison_2%3a3.0.2.dfsg-2_amd64.deb ...
Unpacking bison (2:3.0.2.dfsg-2) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up libbison-dev:amd64 (2:3.0.2.dfsg-2) ...
Setting up bison (2:3.0.2.dfsg-2) ...
update-alternatives: using /usr/bin/bison.yacc to provide /usr/bin/yacc (yacc) in auto mode
```

5. Under the path: ee213/starter_code/matlab_spice_parser,
   open terminal and input: make

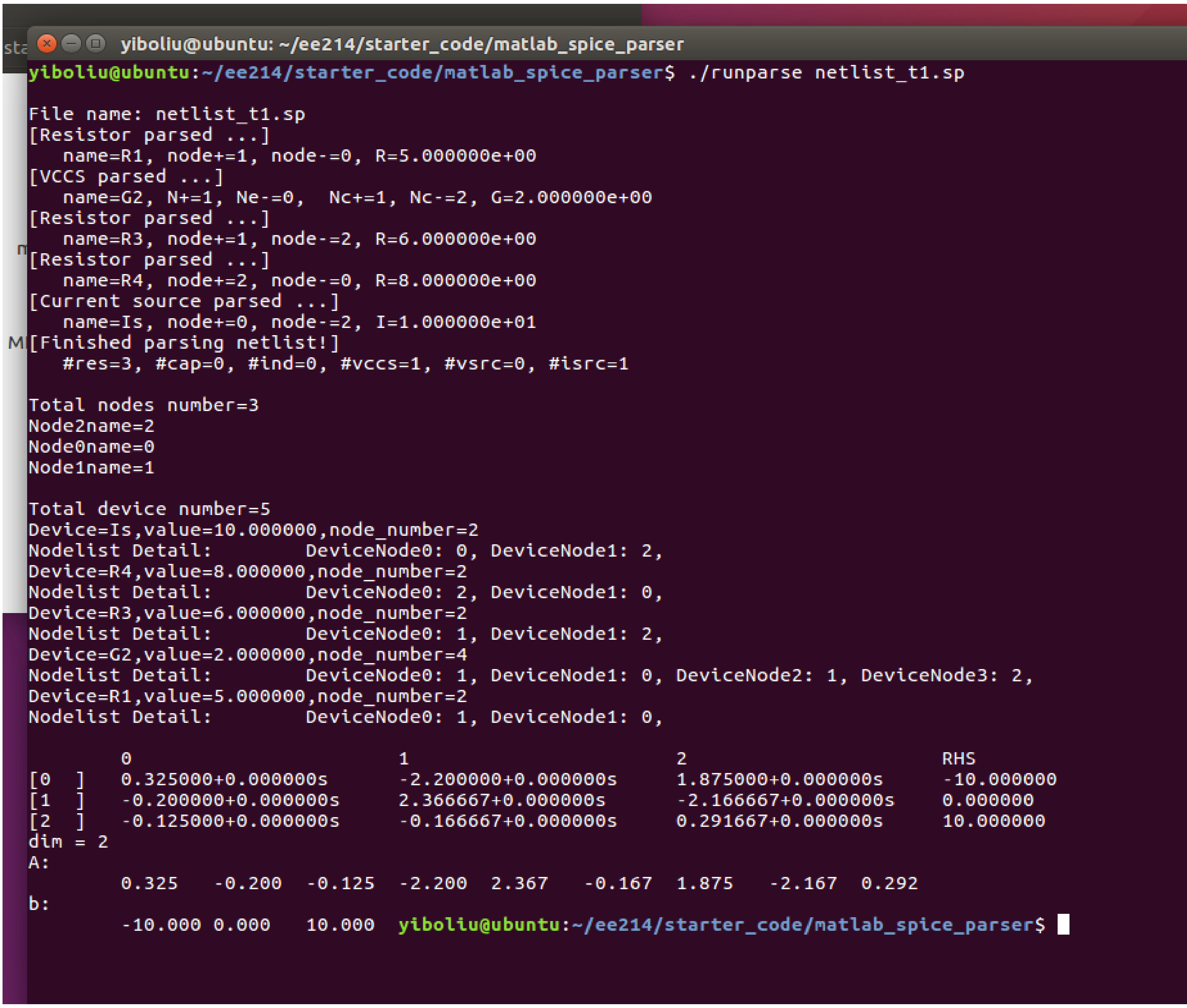
Compile succeed!



```
yiboliu@ubuntu:~/ee213/starter_code/matlab_spice_parser$ make
flex -oparse.yy.c parse.lex
bison -d parse.y
gcc -g -c main.c
In file included from main.c:16:0:
parse.yy.c: In function ‘yy_init_buffer’:
parse.yy.c:1495:40: warning: implicit declaration of function ‘isatty’ [-Wimplicit-function-declaration]
         b->yy_is_interactive = file ? (isatty( fileno(file) ) > 0) : 0;
                                        ^
In file included from main.c:17:0:
parse.y: In function ‘yyerror’:
parse.y:146:2: warning: format not a string literal and no format arguments [-Wformat-security]
  fprintf(stderr, msg);
  ^
main.c: In function ‘Call_Parser’:
main.c:31:2: warning: implicit declaration of function ‘Init_Symbol_Tables’ [-Wimplicit-function-declaration]
  Init_Symbol_Tables();
  ^
main.c:40:2: warning: implicit declaration of function ‘Index_All_Nodes’ [-Wimplicit-function-declaration]
  Index_All_Nodes();
  ^
main.c:41:2: warning: implicit declaration of function ‘Print_Node_Table’ [-Wimplicit-function-declaration]
  Print_Node_Table();
  ^
main.c:42:2: warning: implicit declaration of function ‘Print_Device_Table’ [-Wimplicit-function-declaration]
  Print_Device_Table();
  ^
main.c:44:2: warning: implicit declaration of function ‘Init_MNA_System’ [-Wimplicit-function-declaration]
  Init_MNA_System();
  ^
main.c:45:2: warning: implicit declaration of function ‘Create_MNA_Matrix’ [-Wimplicit-function-declaration]
  Create_MNA_Matrix();
  ^
main.c:46:2: warning: implicit declaration of function ‘Print_MNA_System’ [-Wimplicit-function-declaration]
  Print_MNA_System();
  ^
main.c: In function ‘main’:
main.c:71:8: warning: implicit declaration of function ‘Get_Matrix_Size’ [-Wimplicit-function-declaration]
  dim = Get_Matrix_Size();
        ^
main.c:77:2: warning: implicit declaration of function ‘Get_MNA_System’ [-Wimplicit-function-declaration]
  Get_MNA_System(&A, &b);
  ^
gcc -g -c parse_func.c
gcc -g -c Symbol_Table.c
gcc -g -c MNA_Matrix.c
gcc -g -o runparse main.o parse_func.o Symbol_Table.o MNA_Matrix.o
yiboliu@ubuntu:~/ee213/starter_code/matlab_spice_parser$
```

6. Run the nestlist file:
   In the terminal input: ./test1.sp

This is the final output.



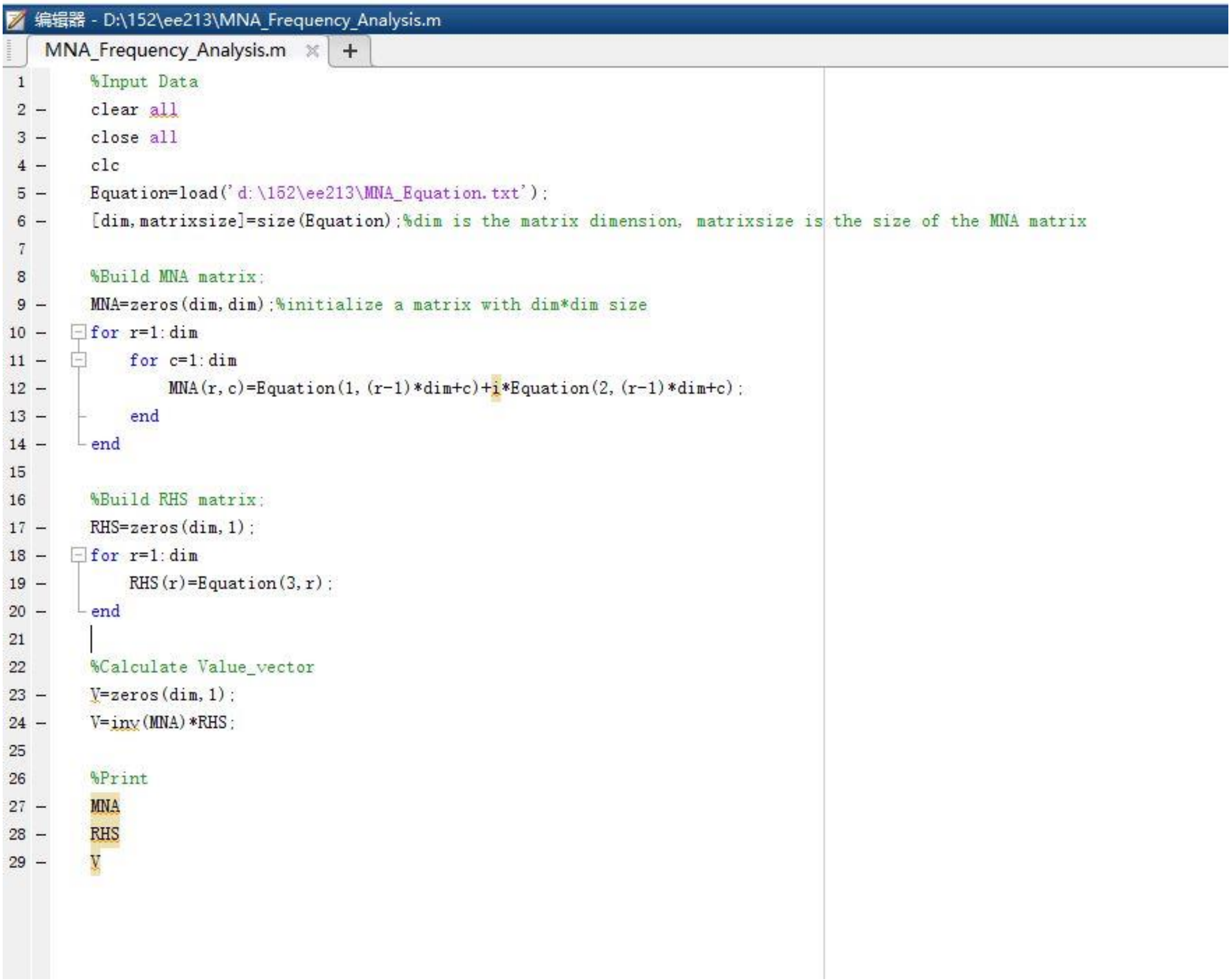
```
yiboliu@ubuntu:~/ee214/starter_code/matlab_spice_parser$ ./runparse netlist_t1.sp

File name: netlist_t1.sp
[Resistor parsed ...]
   name=R1, node+=1, node-=0, R=5.000000e+00
[VCCS parsed ...]
   name=G2, N+=1, Ne-=0,  Nc+=1, Nc-=2, G=2.000000e+00
[Resistor parsed ...]
   name=R3, node+=1, node-=2, R=6.000000e+00
[Resistor parsed ...]
   name=R4, node+=2, node-=0, R=8.000000e+00
[Current source parsed ...]
   name=Is, node+=0, node-=2, I=1.000000e+01
[Finished parsing netlist!]
   #res=3, #cap=0, #ind=0, #vccs=1, #vsrc=0, #isrc=1

Total nodes number=3
Node2name=2
Node0name=0
Node1name=1

Total device number=5
Device=Is,value=10.000000,node_number=2
Nodelist Detail:        DeviceNode0: 0, DeviceNode1: 2,
Device=R4,value=8.000000,node_number=2
Nodelist Detail:        DeviceNode0: 2, DeviceNode1: 0,
Device=R3,value=6.000000,node_number=2
Nodelist Detail:        DeviceNode0: 1, DeviceNode1: 2,
Device=G2,value=2.000000,node_number=4
Nodelist Detail:        DeviceNode0: 1, DeviceNode1: 0, DeviceNode2: 1, DeviceNode3: 2,
Device=R1,value=5.000000,node_number=2
Nodelist Detail:        DeviceNode0: 1, DeviceNode1: 0,

        0                       1                       2                      RHS
[0  ]   0.325000+0.000000s      -2.200000+0.000000s     1.875000+0.000000s     -10.000000
[1  ]   -0.200000+0.000000s     2.366667+0.000000s      -2.166667+0.000000s    0.000000
[2  ]   -0.125000+0.000000s     -0.166667+0.000000s     0.291667+0.000000s     10.000000
dim = 2
A:
        0.325   -0.200  -0.125  -2.200  2.367   -0.167  1.875   -2.167  0.292
b:
        -10.000 0.000   10.000  yiboliu@ubuntu:~/ee214/starter_code/matlab_spice_parser$ 
```

This step will also generate 3 new output data files for Matlab:
Use in MNA frequency domain analysis: *MNA_Equation.txt*
Use in MNA Time domain analysis: *C&L.txt,* *Time_MNA.txt*

Part3. Execute frequency domain analysis in MATLAB

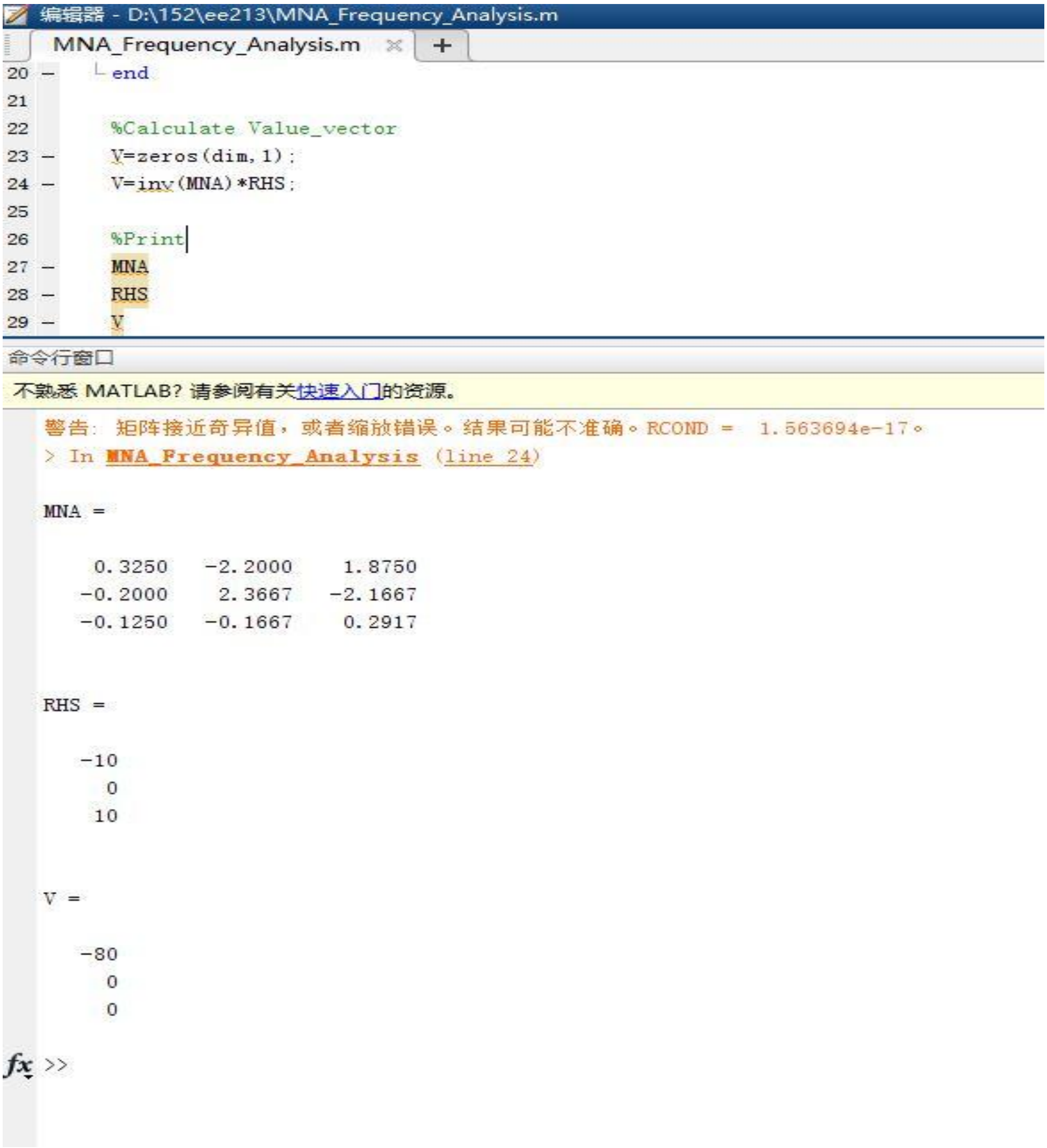
We use ***test1.sp*** in frequency!

1. In Matlab, load the MNA equation data from previous output file and re-build all the matrix in Matlab environment.



```
%Input Data
clear all
close all
clc
Equation=load('d:\152\ee213\MNA_Equation.txt');
[dim,matrixsize]=size(Equation);%dim is the matrix dimension, matrixsize is the size of the MNA matrix

%Build MNA matrix:
MNA=zeros(dim,dim);%initialize a matrix with dim*dim size
for r=1:dim
    for c=1:dim
        MNA(r,c)=Equation(1,(r-1)*dim+c)+i*Equation(2,(r-1)*dim+c);
    end
end

%Build RHS matrix:
RHS=zeros(dim,1);
for r=1:dim
    RHS(r)=Equation(3,r);
end

%Calculate Value_vector
V=zeros(dim,1);
V=inv(MNA)*RHS;

%Print
MNA
RHS
V
```

2. Do the Calculation and show the output answer.



```
20 -    end
21
22      %Calculate Value_vector
23 -    V=zeros(dim,1);
24 -    V=inv(MNA)*RHS;
25
26      %Print
27 -    MNA
28 -    RHS
29 -    V
```

不熟悉 MATLAB? 请参阅有关快速入门的资源。

```
警告: 矩阵接近奇异值，或者缩放错误。结果可能不准确。RCOND =  1.563694e-17。
> In MNA_Frequency_Analysis (line 24)

MNA =

    0.3250   -2.2000    1.8750
   -0.2000    2.3667   -2.1667
   -0.1250   -0.1667    0.2917


RHS =

   -10
     0
    10


V =

   -80
     0
     0

fx >>
```

3. How to run my code?

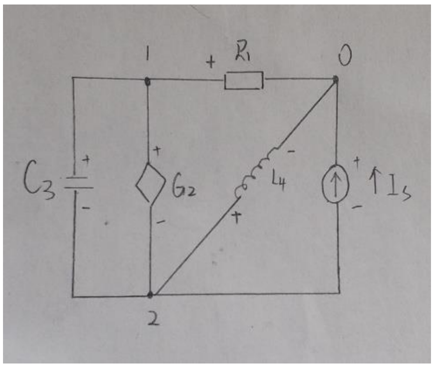
   Place file *MNA_Frequency_Analysis.m* and file *MNA_Equation.txt* under the same folder.

   Open *MNA_Frequency_Analysis.m* in Matlab.

   Run the File(Make sure the path of *MNA_Equation.txt* is correct.)

Part4. MNA Time Domain Analysis:

In this case, we run the *test2.sp*
R1 1 0 5
G2 1 0 1 2 2
C3 1 2 6
L4 2 0 8
Is 0 2 10

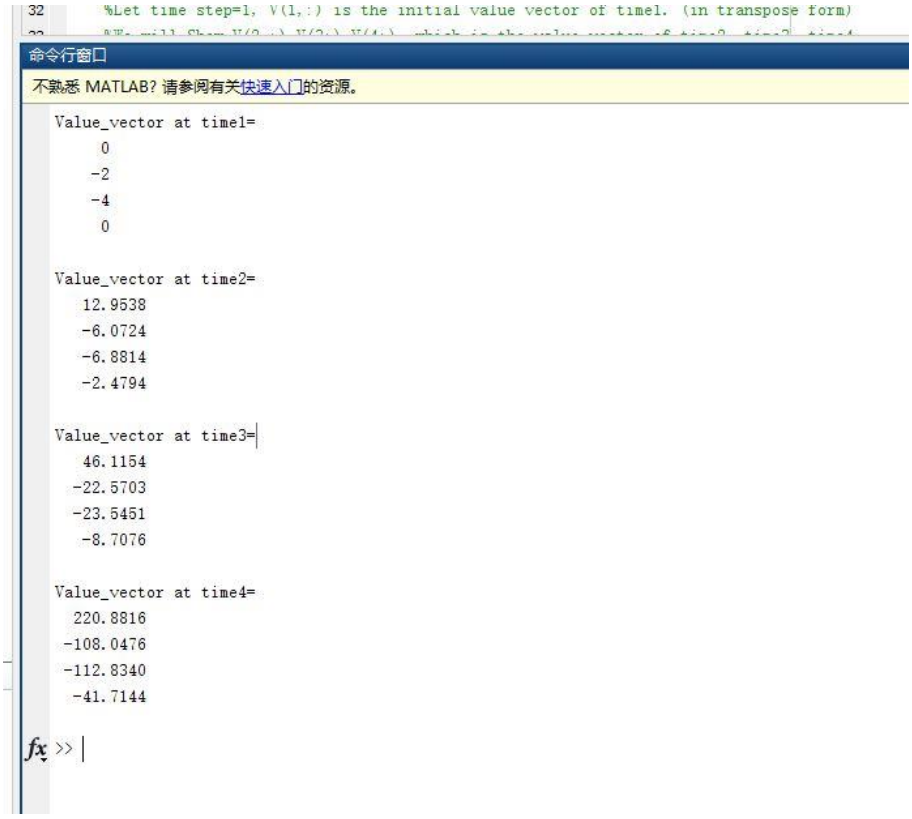


1. Load the MNA data into Matlab and Analysis.
Hint: MNA*V=RHS, hence V=inv(MNA)*RHS. After that use V to renew the MNA.

```
clear all
close all
clc

Equation=load('MNA_Time.txt');
[xxx,matrixsize]=size(Equation);%dim is the matrix dimension, matrixsize is
the size of the MNA matrix
dim=sqrt(matrixsize);

%Build MNA matrix;
MNA=zeros(dim,dim);%initialize a matrix with dim*dim size
for r=1:dim
    for c=1:dim
        MNA(r,c)=Equation(1,(r-1)*dim+c)+Equation(2,(r-1)*dim+c);
    end
end

%RHS_offset matrix: RHS_offset contains the constant_value of
current/voltage source in RHS
RHS_offset=zeros(dim,1);
for r=1:dim
    RHS_offset(r)=Equation(3,r);
end

%RHS_coeffient matrix: contains the constant_value of capacitor and
inductor in RHC
CL=load('C&L.txt');
[CL_num,xx]=size(CL);% CL_num: number of capacitors/inductors
RHS_coeffi=zeros(dim,1);
for r=1:CL_num
    RHS_coeffi(CL(r,1)+1)=RHS_coeffi(CL(r,1))+CL(r,2);
end
```

```
%Let time step=1, V(1,:) is the initial value vector of time1. (in
transpose form)
%We will Show V(2,:),V(3:),V(4:), which is the value vector of time2, time3,
time4.
step_num=4;
V=zeros(step_num,dim);

V(1,:)=[0,-2,-4,0];% This initial value node voltage should be input case
by case!!!!

%Newton-Rapthon
RHS=zeros(dim,1);
for i=2:step_num
    RHS=RHS_offset+ RHS_coeffi .* V(i-1,:)';
    V(i,:)=(pinv(MNA)*RHS)';
end


%OUTPUT
for i=1:step_num
    disp(['Value_vector at time',num2str(i),'=']);
    disp(V(i,:)');
end
```

2. This is the output by Newton-Raphon iteration:



```
%Let time step=1, V(1,:) is the initial value vector of time1. (in transpose form)
```

不熟悉 MATLAB? 请参阅有关快速入门的资源。

```
Value_vector at time1=
     0
    -2
    -4
     0

Value_vector at time2=
   12.9538
   -6.0724
   -6.8814
   -2.4794

Value_vector at time3=
   46.1154
  -22.5703
  -23.5451
   -8.7076

Value_vector at time4=
  220.8816
 -108.0476
 -112.8340
  -41.7144

>>
```

(Default time step h=1)

4. How to Run My code?

Run test2.sp to get the output I use in this part.

Place file *MNA_Time_Analysis.m, file Time_MNA.txt* Cand file *C&l.txt* under the same folder.