

## ss-new-2

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### 1 LC circuit example, resonant tank or buck converter, state-space model

dimension parameters

```
[1]: nb = 4;  
     nnm1 = 2;  
     ns = 2;  
     ni = 2;  
     #  
     nt = 2 * nb + nnm1;  
     no = nt - ns;
```

circuit parameters

```
[2]: C = 10e-6;  
     L = 10e-6;
```

adjusted tableau matrix

```
[3]: T = [  
    1  0  0  0  0  0  0  0  0  0  0 -1  0  0  0  
    0  1  1  0  0  0  0  0  0  0  0  1  0  0  0  
    0  0  0  1  0  0 -1  0  0  0  0  0  0  0  0  
    0  0  0  0  1  0 -1  1  0  0  0  0  0  0  0  
    0  0  0  0  0  0  0 -1  0  0  0  0 -1  0  0  
    0  0  0  0  0  1  0 -1  0  0  0  0  0  0  0  
    0  0  0  1  0  0  0  0  0  0  0  0  0  1  0  
    0  0  0  0 -1  0  0  0  0  L  0  0  0  0  0  
    0 -1  0  0  0  0  0  0  0  0  C  0  0  0  0  
    0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  
];
```

reduced row echelon form

```
[4]: Trref = rref(T)
```

Trref =

Columns 1 through 5:

1.00000	0.00000	0.00000	0.00000	0.00000
0.00000	1.00000	0.00000	0.00000	0.00000
0.00000	0.00000	1.00000	0.00000	0.00000
0.00000	0.00000	0.00000	1.00000	0.00000
0.00000	0.00000	0.00000	0.00000	1.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000

Columns 6 through 10:

0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000
1.00000	0.00000	0.00000	0.00000	0.00000
0.00000	1.00000	0.00000	0.00000	-0.00000
0.00000	0.00000	1.00000	-0.00000	-0.00000
0.00000	0.00000	0.00000	1.00000	-0.00000
0.00000	0.00000	0.00000	0.00000	1.00000

Columns 11 through 14:

-1.00000	0.00000	0.00000	0.00000
1.00000	0.00000	0.00000	-1.00000
0.00000	0.00000	0.00000	1.00000
0.00000	0.00000	1.00000	0.00000
0.00000	-1.00000	1.00000	0.00000
0.00000	1.00000	0.00000	0.00000
-0.00000	0.00000	1.00000	-0.00000
-0.00000	1.00000	-0.00000	-0.00000
-0.00000	-100000.00000	100000.00000	-0.00000
100000.00000	-0.00000	-0.00000	-100000.00000

extract state-space model matrices

```
[5]: if (Trref(nt, nt) == 1)
      A = Trref(no + 1 : nt, nt + 1 : nt + ns)
      B = Trref(no + 1 : nt, nt + ns + 1 : nt + ns + ni)
      C = Trref(1 : no, nt + 1 : nt + ns)
      D = Trref(1 : no, nt + ns + 1 : nt + ns + ni)
elseif
```

```

disp('something wrong, possible algebraic degeneration')
endif

```

A =

```

-0.00000 -100000.00000
100000.00000 -0.00000

```

B =

```

100000.00000 -0.00000
-0.00000 -100000.00000

```

C =

```

-1.00000 0.00000
1.00000 0.00000
0.00000 0.00000
0.00000 0.00000
0.00000 -1.00000
0.00000 1.00000
-0.00000 0.00000
-0.00000 1.00000

```

D =

```

0.00000 0.00000
0.00000 -1.00000
0.00000 1.00000
1.00000 0.00000
1.00000 0.00000
0.00000 0.00000
1.00000 -0.00000
-0.00000 -0.00000

```

```

[6]: save Ap2 A
      save Bp2 B
      save Cp2 C
      save Dp2 D

```

find eigenfrequencies of the state-space model

```

[7]: poles = eig(A)

```

poles =

```

-0.00000 + 100000.00000i

```

-0.00000 - 100000.00000i

```
[8]: save polesp2 poles
```