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Module 17 Alex Yeoh Table 11

```
sympref('FloatingPointOutput',true);
```

5.8a

```
clear all
% Declare symbolic variables
syms Iin vo
vo = solve(-Iin + (0-vo)/2000, vo)
subs(vo,Iin,1e-3)
%
```

```
vo =

-2000*Iin


ans =

-2
```

5.8b

```
clear all
% Declare symbolic variables
syms vo V1 V2
```

```
vo = solve((V1-V2-vo)/10000 ,vo)
subs(vo,[V1,V2],[1,2])
%
```

```
vo =

V1 - V2


ans =

-1
```

5.12

```
clear all
% Declare symbolic variables
syms vo vs
vo = solve((0-vs)/5000+(0-vo)/25000, vo)
H = vo/vs
%
```

```
vo =

-5*vs


H =

-5
```

5.17

```
clear all
% Declare symbolic variables
syms vi vo Rf
vo = solve((0-vi)/5000+(0-vo)/Rf, vo)
H1 = subs(vo,Rf,12000)/vi
H2 = subs(vo,Rf,80000)/vi
H3 = subs(vo,Rf,2000000)/vi
%
```

```
vo =

-2.0000e-04*Rf*vi
```

```
H1 =

-2.4000


H2 =

-16


H3 =

-400
```

5.22 see drawing

```
reshape(blanks(25),25,1)

%


ans =

  25×1 char array

    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
```

5.23

```
clear all
% Declare symbolic variables
syms vo vs r1 r2 rf
vo = solve((0-vs)/r1+0/r2+(0-vo)/rf, vo)
H=simplify(vo/vs)
%
```

```
vo =

-(rf*vs)/r1


H =

-rf/r1
```

5.27

```
clear all
syms va vo Vin
[va,vo] = solve(va/24+(va-Vin)/16, (va/(8+12))*12==vo, va,vo)
%vo equation is the current from the inverting input to ground multiplied
%by the voltage at the resistor of interested
subs(vo,Vin,7.5)
%
```

```
va =

0.6000*Vin


vo =

0.3600*Vin


ans =

2.7000
```

5.29

```
clear all
syms va vo vi r1 r2
[va,vo]=solve(va/r2+(va-vi)/r1, va/r1+(va-vo)/r2, va,vo)
H=vo/vi
```

```
%
```

```
va =

(r2*vi)/(r1 + r2)


vo =

(r2*vi)/r1


H =

r2/r1
```

5.32

```
clear all
syms vin va vo ix %va uses equation from table 5.3
[va, vo, ix]=solve(vin/10000+(vin-va)/50000, (vo-va)/20000+vo/60000+vo/30000,
 (va-vo)/20000==ix, va,vo,ix)
ix=subs(ix,vin,0.004)
vo=subs(vo,vin,0.004)
H = simplify(vo/vin)
%
```

```
va =

6*vin


vo =

3*vin


ix =

1.5000e-04*vin


ix =

6.0000e-07


vo =

0.0120
```

```
H =

0.0120/vin
```

5.38

```
clear all
syms vo v1 v2 v3 v4 r1 r2 r3 r4 r5
vo=solve(-v1/r1+-v2/r2-v3/r3-v4/r4-vo/r5, vo)
%


vo =

-r5*(v1/r1 + v2/r2 + v3/r3 + v4/r4)
```

5.40

```
clear all
syms va vo v1 v2
[va,vo]=solve(-v1/100000-v2/100000-va/200000, va/(10+40)*40==vo, va,vo)
%


va =

- 2*v1 - 2*v2


vo =

- 1.6000*v1 - 1.6000*v2
```

5.45 see drawing

```
reshape(blanks(25),25,1)


ans =

  25×1 char array

    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
```

```
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
    ' '
```

5.54

```
clear all
syms vs va vo r
[va,vo]=solve(-vs/r-va/r-vo/r, va/r+(va-vo)/r, va,vo)
H=vo/vs
%
```

```
va =

-0.3333*vs


vo =

-0.6667*vs


H =

-0.6667
```

5.57

```
clear all
syms va vb vo vs1 vs2
[va,vb,vo]=solve(-vs1/25000-va/50000, -vs2/50000-va/100000-vb/100000,
 vb/50000+(vb-vo)/100000, va,vb,vo)
%
```

```
va =

-2*vs1


vb =

2*vs1 - 2*vs2


vo =

6*vs1 - 6*vs2
```

5.59

```
clear all
syms vs va vo r
[va,vo]=solve(vs/r+(vs-va)/(2*r), -va/r-vo/(4*r), va,vo)
H=subs(vo,r,10000)/vs
%
```

```
va =

3*vs


vo =

-12*vs


H =

-12
```

5.60

```
clear all
syms va vo vi
[va,vo]=solve(-vi/5000-va/10000-vo/4000, va/10000+(va-vo)/2000, va,vo)
H=vo/vi
%
```

```
va =

-0.5000*vi
```

```
vo =

-0.6000*vi


H =

-0.6000
```

5.65

```
clear all
syms va vb vo vin
[va,vb,vo]=solve(vin==va, -va/10000-vb/30000, vb/40000+(vb-vo)/8000, va,vb,vo)
%equation va is not necessary, could directly use vin
subs(vo,vin,0.006)
%


va =

vin


vb =

-3*vin


vo =

-3.6000*vin


ans =

-0.0216
```

5.71

```
clear all
syms va vb vc vo v15 v225
[va,vb,vc,vo]=solve(v225==va, va/30000+(va-vb)/50000, -v15/5000-vc/20000, -
vb/80000-vc/40000-vo/100000, va,vb,vc,vo)
subs(vo,[v15,v225],[1.5,2.25])
%


va =

v225
```

```
vb =

2.6667*v225


vc =

-4*v15


vo =

10*v15 - 3.3333*v225


ans =

7.5000
```

5.73

```
clear all
syms va vb vl v18
[va,vb,vl]=solve(v18==va, va/10000+(va-vb)/50000, vb==vl, va,vb,vl)
subs(vl,v18,1.8)
%
```

```
va =

v18


vb =

6*v18


vl =

6*v18


ans =

10.8000
```

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