# Module 11

```
sympref('FloatingPointOutput',true); format short; format compact

%%9.40
clear all
syms Vin va io s t
[va,io]=solve((va-Vin)/s+va/2+va*0.05*s, (Vin-va)/s-io, va, io);
Hio(s) = simplify(io/Vin);

VinAmp = 4
disp("a")
w = 1
io(t) = VinAmp*abs(Hio(j*w))*cos(w*t + angle(Hio(j*w)))
disp("b")
w=5
io(t) = VinAmp*abs(Hio(j*w))*cos(w*t + angle(Hio(j*w)))
disp("c")
w=10
io(t) = VinAmp*abs(Hio(j*w))*cos(w*t + angle(Hio(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
     4
a
w =
     1
io(t) =
1.8723*cos(t - 0.3848)
b
w =
     5
io(t) =
0.8900*cos(5*t - 1.2068)
c
w =
    10
io(t) =
0.4417*cos(10*t - 1.4601)
```

```
%%9.42
clear all
syms Vin va vb vo s t
[va,vb]=solve((va-Vin)/30+(va-vb)/50+(va-vb)*50e-6*s, (vb-va)/50+(vb-
va)*50e-6*s+vb/(0.1*s), va, vb);
Hvo(s) = simplify(vo/Vin);
vo=vb

VinAmp = 60
w = 200
vo(t) = VinAmp*abs(Hvo(j*w))*cos(w*t - (pi/2) + angle(Hvo(j*w)))

disp(" ") % just adds a blank line
```

```
vo =
(Vin*s*(s + 400))/(s^2 + 700*s + 320000)
VinAmp =
    60
w =
   200
vo(t) =
(60*abs(vo)*cos(200*t + angle(vo/Vin) - 1.5708))/abs(Vin)
```

```
%%9.44
clear all
syms Vin va i s t
```

```
[va,i]=solve((va-Vin)/5+va/4+va/(10e-3*s)+va/(1/(5e-3*s)+3), (Vin-va)/5-i, va,
 i);
H(s) = simplify(i/Vin);

VinAmp = 6
w = 200
i(t) = VinAmp*abs(H(j*w))*cos(w*t + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
     6
w =
   200
i(t) =
0.9601*cos(200*t - 0.1388)
```

```
%%9.47
clear all
syms Vin va is s t
[va,is]=solve((va-Vin)/2+va*50e-6*s+va/(2e-3*s+20), (Vin-va)/2-is, va, is);
H(s) = simplify(is/Vin);

VinAmp = 5
w = 2000
is(t) = VinAmp*abs(H(j*w))*cos(w*t + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
     5
w =
        2000
is(t) =
0.4608*cos(2000*t + 0.9185)
```

```
%%9.48
clear all
syms Vin va ix s t
[va,ix]=solve((va-Vin)/10+va/(0.2*s)+va/(30+1/(0.5e-3*s)), va/(30+1/
(0.5e-3*s))-ix, va, ix);
H(s) = simplify(ix/Vin);

VinAmp = 20
w = 100
ix(t) = VinAmp*abs(H(j*w))*cos(w*t -(pi/2)-40*pi/180 + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
    20
w =
   100
```

```
ix(t) =
0.4339*cos(100*t - 1.4068)
```

```
%%9.50
clear all
syms Iin va vx s t
[va,vx]=solve(-Iin+va*1e-3*s+va/(0.1*s+20), va/(0.1*s+20)*20-vx, va, vx);
H(s) = simplify(vx/Iin);

VinAmp = 5
w = 100
ix(t) = VinAmp*abs(H(j*w))*cos(w*t -40*pi/180 + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
     5
w =
   100
ix(t) =
50*cos(100*t - 2.2689)
```

```
%%9.56 no idea
```

# Problem 10.4

```
clear all
syms Vin ix va s t % notice we added a symbolic "t" for the display below
[va,ix]=solve(-0.5*ix + (va-Vin)/(1*s) + va/(1/(0.25*s) + 1) ==0,...
    ix == (Vin-va)/(1*s), va, ix)
%
vo = va*1/(1/(0.25*s) + 1)
%
Hvo(s) = simplify(vo/Vin)
%
% Now answer the author's question by evaluating Hvo(j*4) at s = j4
VinAmp = 16  % the input amplitude
w = 4 % the radian frequency, so that
vo(t) = VinAmp*abs(Hvo(j*w))*cos(w*t - (pi/2) - 10*2*pi/360 + angle(Hvo(j*w)))

% Notice that cos() is an even function so that
% cos(2.7757 - 4*t) = cos(4*t - 2.7757)
% Don't know why Matlab decided to go that way
disp(" ") % just adds a blank line
```

```
va =
(3*Vin*(s + 4))/(2*s^2 + 3*s + 12)
ix =
(2*Vin*s)/(2*s^2 + 3*s + 12)
vo =
(3*Vin*(s + 4))/((4/s + 1)*(2*s^2 + 3*s + 12))
Hvo(s) =
```

```
(3*s)/(2*s^2 + 3*s + 12)
VinAmp =
    16
w =
     4
vo(t) =
8.2319*cos(2.7757 - 4*t)
```

```
%%10.8
clear all
syms Iin va vb io vo s t
[va, vb, io, vo]=solve(-Iin+va/20+va*(50e-6)*s+(va-vb)/40-0.1*vo, 0.1*vo+(vb-
va)/40+vb/(100*10e-3*s), (va-vb)/40-io, va-vo, va, vb, io, vo);
H(s) = simplify(io/Iin);

VinAmp = 6
w = 200
ix(t) = VinAmp*abs(H(j*w))*cos(w*t+15*pi/180 + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
     6
w =
   200
ix(t) =
11.1003*cos(200*t - 0.0690)
```

```
%%10.10
clear all
syms Iin va vo vx s t
[va, vo, vx]=solve(-Iin+va/2000+va/(50*10e-3*s)+(va-vo)*2*10e-6*s, 0.1*vx
+vo/4000+(vo-va)*2*10e-6*s, va/(50*10e-3*s)-vx, va, vo, vx);
H(s) = simplify(vo/Iin);

VinAmp = 36
w = 2000
ix(t) = VinAmp*abs(H(j*w))*cos(w*t -(pi/2) + angle(H(j*w)))

disp(" ") % just adds a blank line
```

```
VinAmp =
    36
w =
        2000
ix(t) =
2.7127e+04*cos(2000*t - 0.5932)
```

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