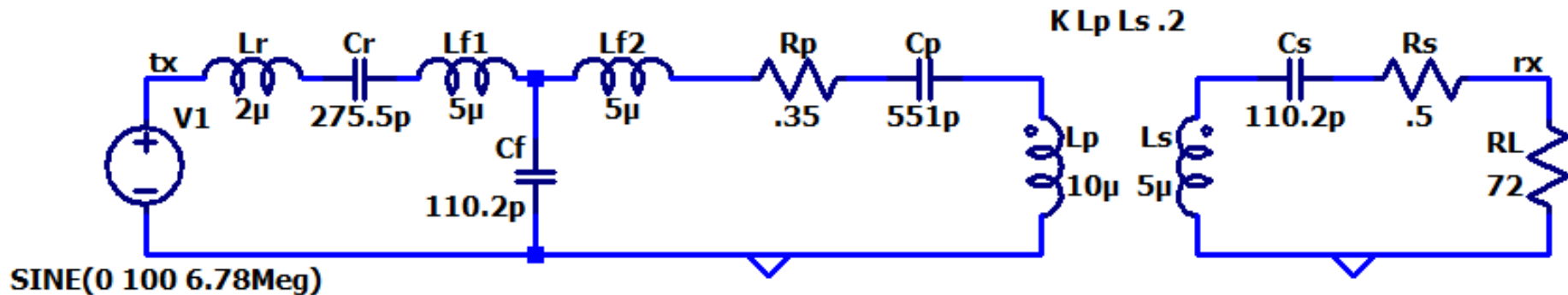


Circuit Solution Tips

- Stay symbolic as long as possible
 - Define new equivalent variables as necessary
- Order of analysis
 - Series/parallel equivalents
 - Source transformations
 - Transformer reflection
 - KVL/KCL equations (if you see a path forward)
 - Element Equations
 - Node Voltage / Mesh Current Analysis (otherwise)

Numerical Example



MATLAB Code:

```
Z1 = 1j*(w*Lr + w*Lf1 - 1/w/Cr);
Z2 = -1j/w/Cf;
Z3 = Rp + 1j*(w*Lf2 - 1/w/Cp);
Z4 = 1j*w*Lp;
Z5 = 1j*w*Lk;
Z6 = Rs - 1j/w/Cs;
```

```
Va = N*VTX*(Z1*Z2/(Z1+Z2))/(Z1*(Z3+Z1*Z2/(Z1+Z2)))*1/(1/Z4 ...
      + 1/(Z3 + Z1*Z2/(Z1+Z2)));
```

```
Za = N^2*1/(1/(Z3+Z1*Z2/(Z1+Z2)) + 1/Z4);
Zb = Z5*N^2;
```

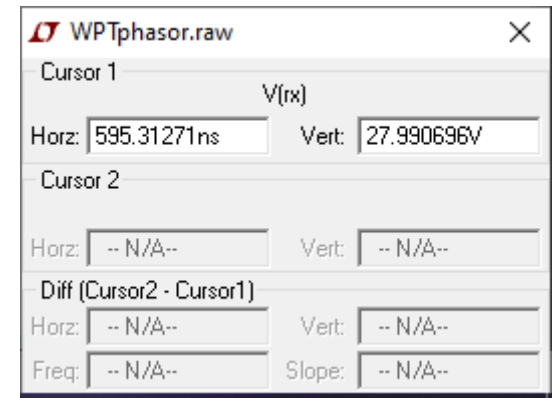
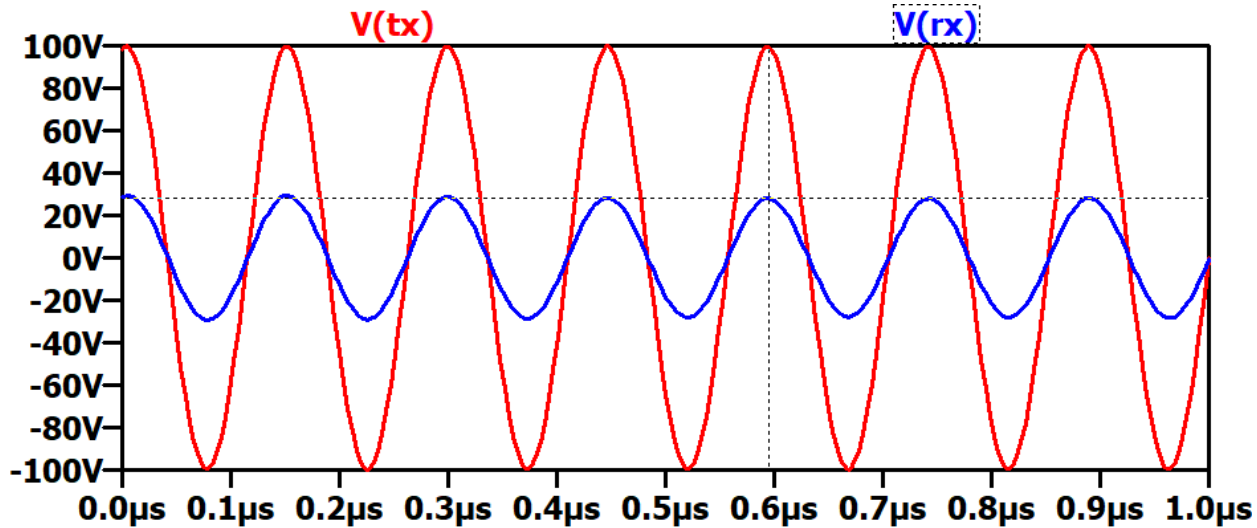
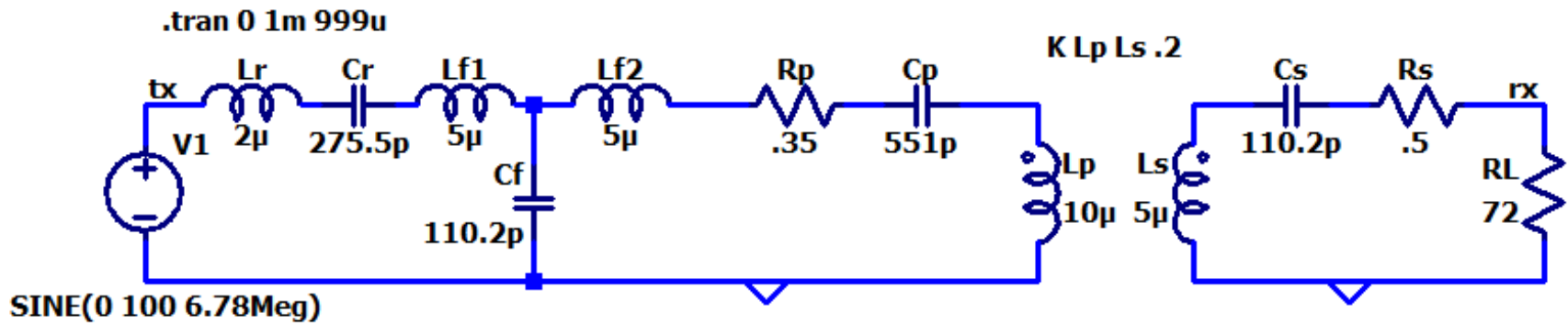
```
VRX = Va*RL/(Za+Zb+Z6+RL);
```

```
mag = abs(VRX)
phase = angle(VRX)/pi*180
```

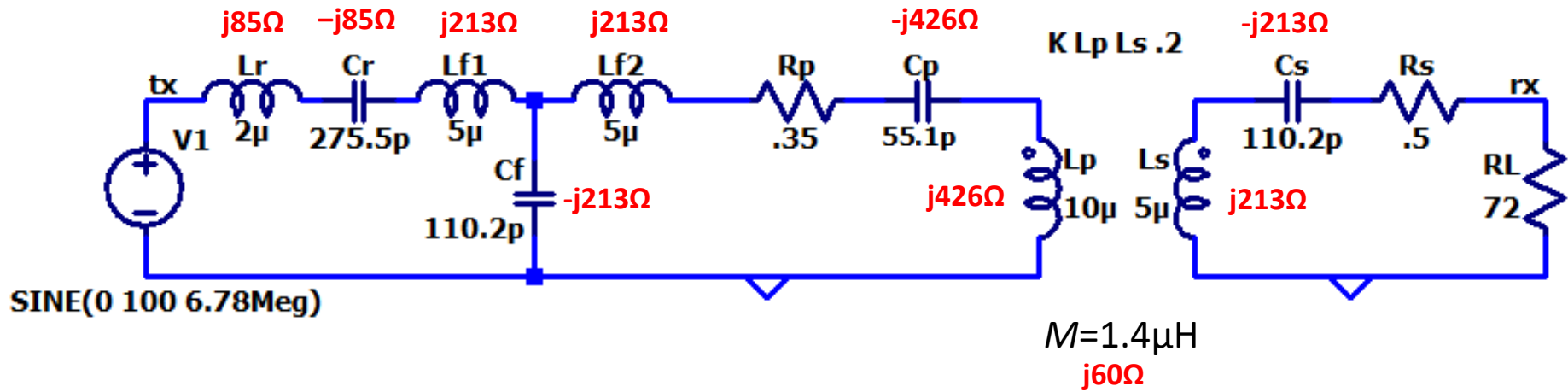
mag =
28.0892

phase =
-90.0000

Circuit Simulation

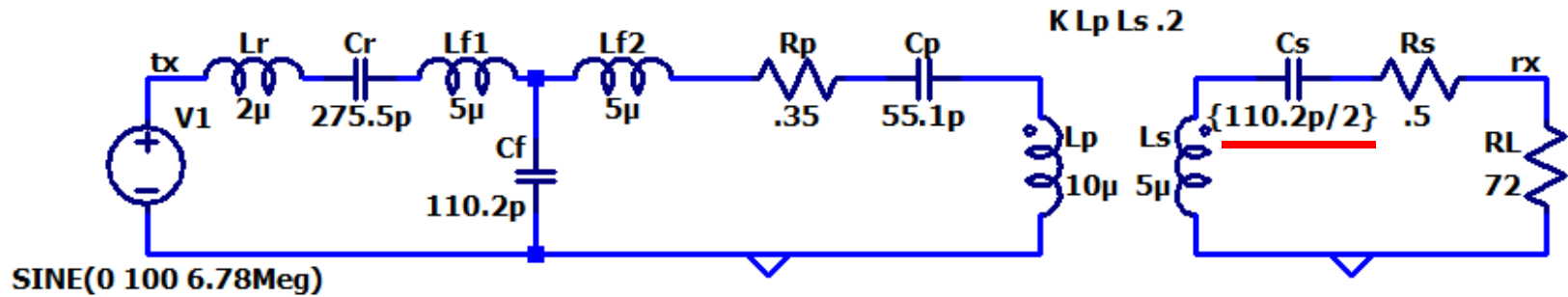


Resonance





Numerical Example 2



MATLAB Result:

mag =

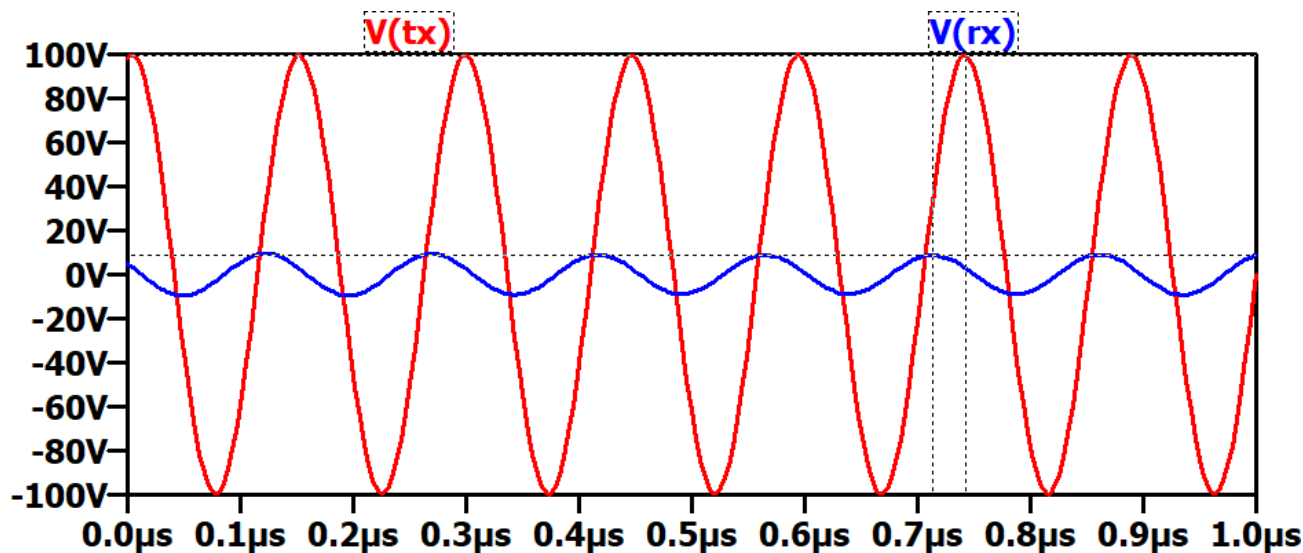
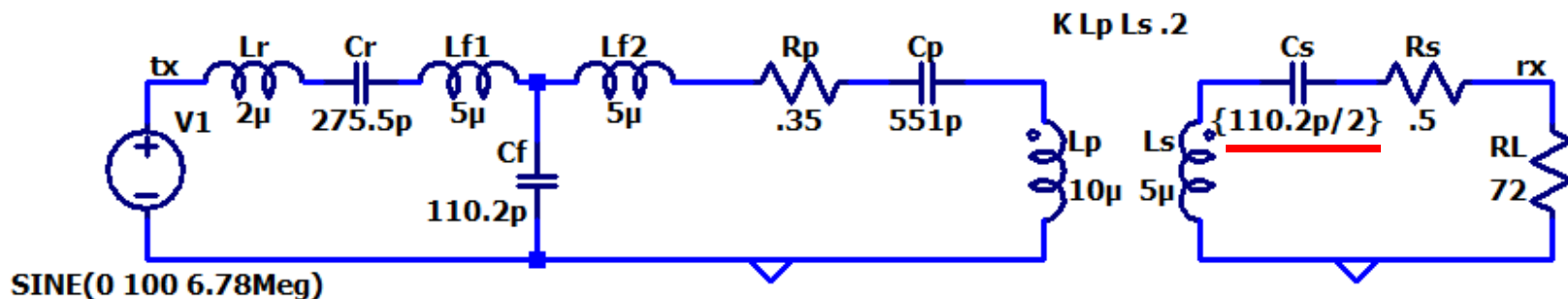
9.06

phase =

-18.7973

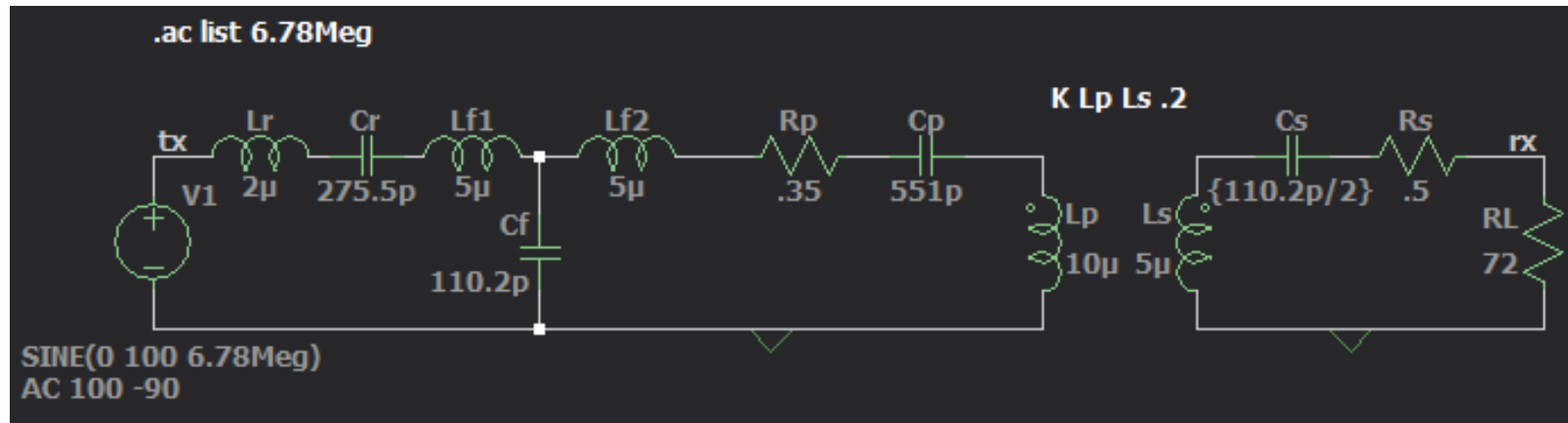
Circuit Simulation 2

.tran 0 1m 999u



Cursor 1	
Horz:	742.80534ns
Vert:	99.533096V
Cursor 2	
Horz:	712.84545ns
Vert:	8.8561678V
Diff (Cursor2 - Cursor1)	
Horz:	-29.959884ns
Vert:	-90.676929V
Freq:	33.377966MHz
Slope:	3.02661e+009

AC Analysis



Edit Simulation Command

Transient **AC Analysis** DC sweep Noise DC Transfer DC op prt

Compute the small signal AC behavior of the circuit linearized about its DC operating point.

Type of sweep: List

1st frequency: 6.78Meg

2nd frequency:

3rd frequency:

Syntax: .ac list <Freq1> [<Freq2> [<Freq3> [...]]]

.ac list 6.78Meg

Cancel OK

Independent Voltage Source - V1

Functions

- (none)
- PULSE(V1 V2 Tdelay Trise Tfall Ton Period Ncycles)
- SINE(Voffset Vamp Freq Td Theta Phi Ncycles)
- EXP(V1 V2 Td1 Tau1 Td2 Tau2)
- SFFM(Voff Vamp Fcar MDI Fsig)
- PWL(t1 v1 t2 v2...)
- PWL FILE: Browse

DC offset[V]: 0

Amplitude[V]: 100

Freq[Hz]: 6.78Meg

Tdelay[s]:

Theta[1/s]:

Phi[deg]:

Ncycles:

Additional PWL Points

Make this information visible on schematic:

DC Value

DC value:

Make this information visible on schematic:

Small signal AC analysis(.AC)

AC Amplitude: 100

AC Phase: -90

Make this information visible on schematic:

Parasitic Properties

Series Resistance[Ω]:

Parallel Capacitance[F]:

Make this information visible on schematic:

Cancel OK

AC Simulation Results (Single Point)

* C:\Users\dcostine\Dropbox\Courses\UTK Courses\ECE 202\In Class Examples\WPTExample-Phasors\WPT... X

--- AC Analysis ---

frequency:	6.78e+006	Hz		
V(tx) :	mag: 100	phase: -90°		voltage
V(n001) :	mag: 174.844	phase: -90.3419°		voltage
V(n002) :	mag: 99.9949	phase: -90.0005°		voltage
V(n003) :	mag: 287.109	phase: -90.5205°		voltage
V(n004) :	mag: 187.14	phase: -90.798°		voltage
V(n006) :	mag: 207.132	phase: -90.6756°		voltage
V(n007) :	mag: 54.3051	phase: -99.138°		voltage
V(n005) :	mag: 187.137	phase: -90.7477°		voltage
V(n008) :	mag: 9.11047	phase: -18.7958°		voltage
V(rx) :	mag: 9.04764	phase: -18.7958°		voltage
I(Cs) :	mag: 0.125662	phase: -18.7958°		device_current
I(Cp) :	mag: 0.469369	phase: 179.999°		device_current
I(Cf) :	mag: 1.34784	phase: 179.48°		device_current
I(Cr) :	mag: 0.878499	phase: 179.202°		device_current
I(Ls) :	mag: 0.125662	phase: -18.7958°		device_current
I(Lp) :	mag: 0.469369	phase: -0.000865793°		device_current
I(Lf2) :	mag: 0.469369	phase: 179.999°		device_current
I(Lf1) :	mag: 0.878499	phase: -0.798129°		device_current
I(Lr) :	mag: 0.878499	phase: -0.798129°		device_current
I(Rp) :	mag: 0.469369	phase: -0.000865793°		device_current
I(Rl) :	mag: 0.125662	phase: 161.204°		device_current
I(Rs) :	mag: 0.125662	phase: 161.204°		device_current
I(Vl) :	mag: 0.878499	phase: 179.202°		device_current

Frequency Sweep

