EE 211
Lecture 6

Feb. 24, 2006

Topics

- Mid term exam
- Prelab policy
- Pspice Analysis
- Frequency Response

Mid-term Exam

- Closed book, closed notes
- 1 hour, in class
- Bring calculators
- Covers Labs 1-12
- Expect at least one question from each lab
- Short answer format similar to the example– expect 25 questions.

Prelab policy

- We will now begin collecting and grading all prelab materials.

Labs 12-13 Pspice Analysis

- Pspice is a circuit simulator program
- It uses libraries of components to define circuits and simulate them.
- Probe provides graphical output for the results
- Pspice includes transient, dc, transfer function, and other simulations modes

Pspice circuit files

Passive components– R, L and C
The 1st character in a name defines the device type.
The name is followed by the node numbers. The final number is the value of the component.

```
CANG2   610 605 1.0ufd
RANG2   605 0 10kohm
*
*field circuit
RF 630 632 0.001 ;  field resistance
LPF    633 634 .2546mH
VF 630 0 .002
```

Independent Sources

V=voltage source
I= current source

Examples of DC, sinusoidal, and pulse voltages.

```
VF 630 0 .002volts
*                          (offset mag      freq    td    df     angle)
VBUSA   200  0 SIN(0        1.414V 60.0    0     0      0)
*                            initialval finalval delay    risetime     falltime    pulse width     period
IPMECH  0 600 pulse (1.0A          0.0A      0          0.01msec   0.01msec 40msec          100msec)
```

The Main circuit for a comparator

- The main Program

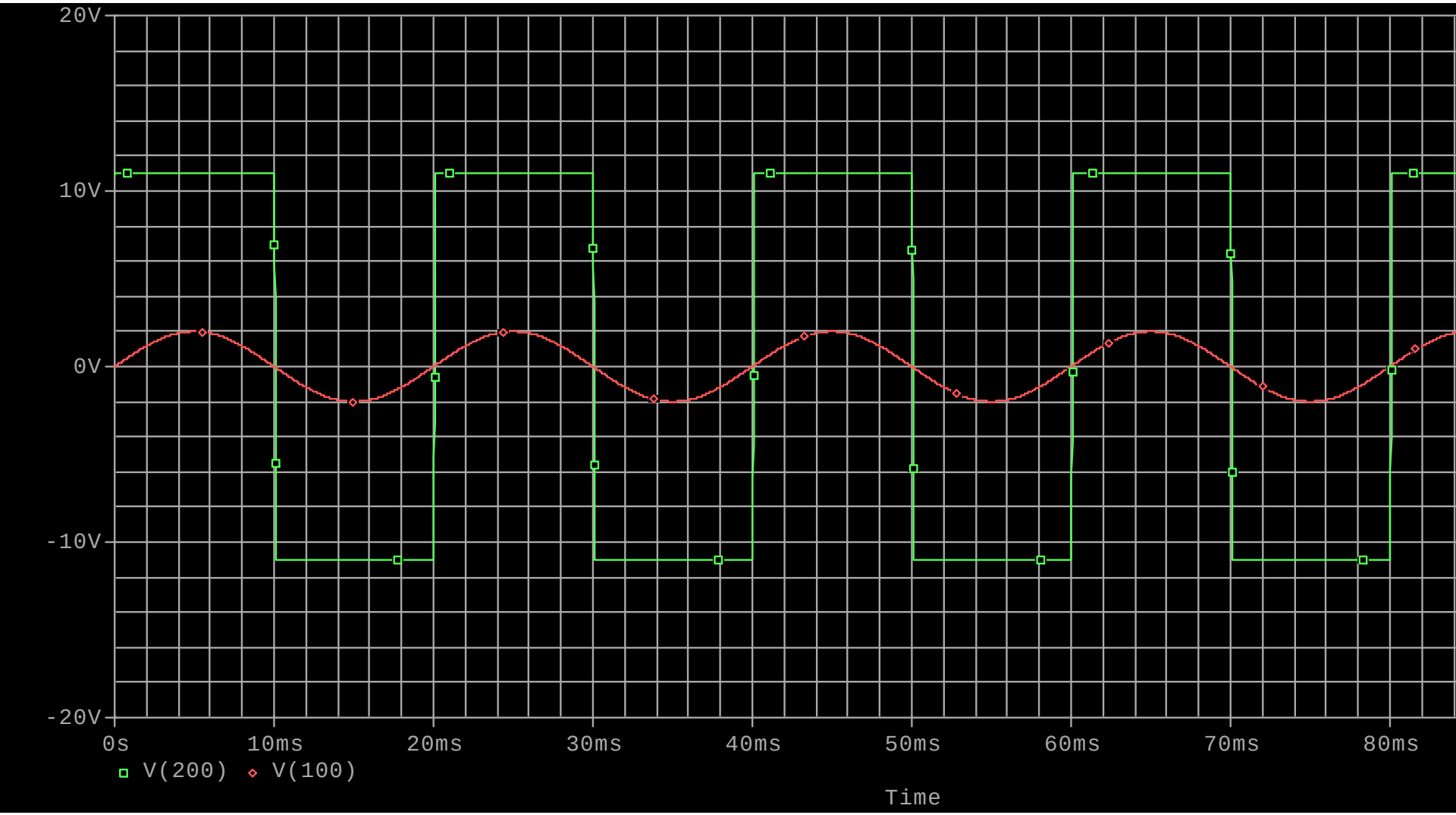
```
vi 11 0 sin(0 2 100 0 0)
* op-amp terminals:  +in -in +ps -ps out
xOAmp                11   0    14   15  20    LM741/NS
Vcc 14 0 dc +12v
Vee 15 0 dc -12v
Rout 20 0 1kohm
```

- NOTE---- X indicates a call to a subcircuit

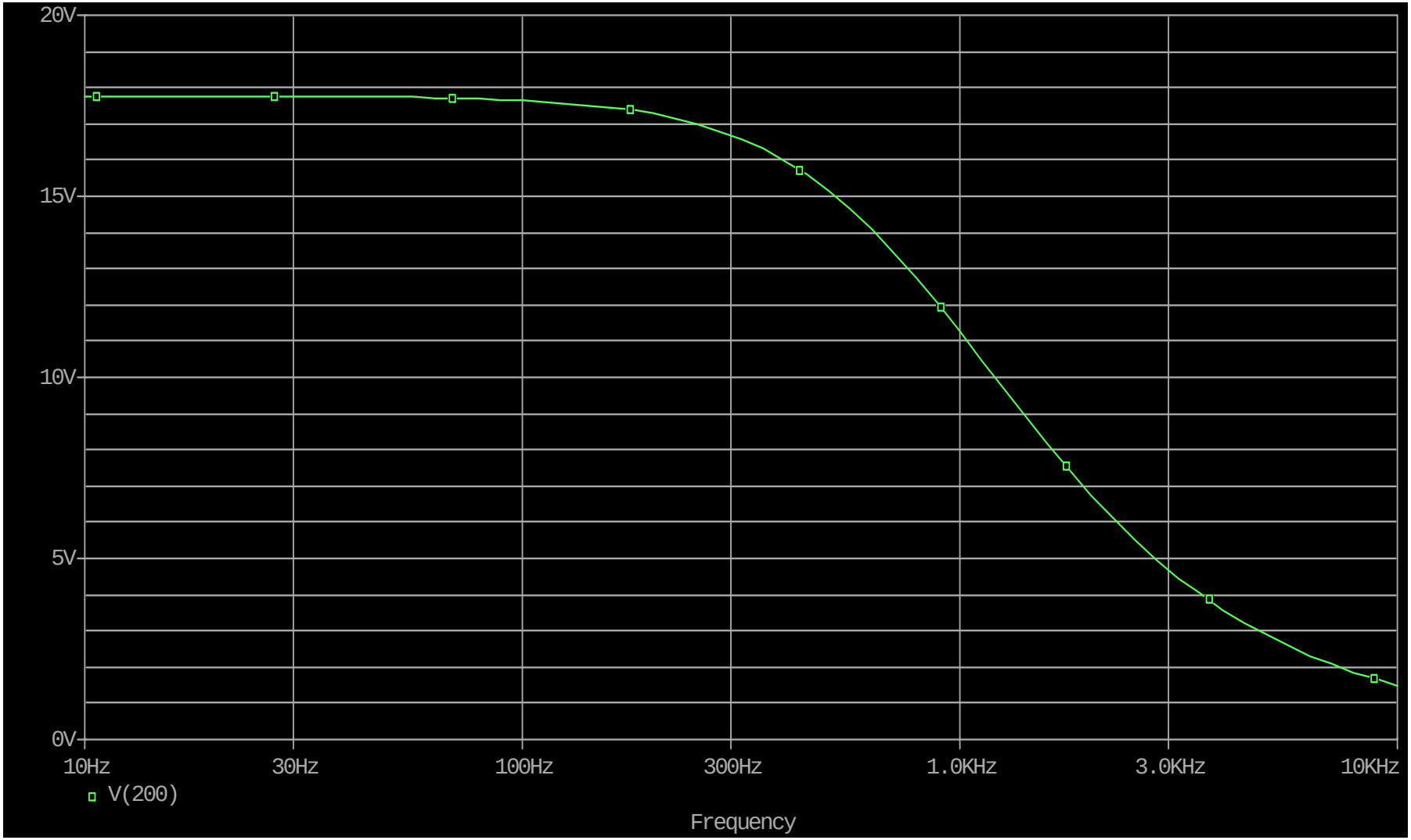
```
*////////////////////////////////////////////////////////////////////
* Legal Notice: This material is intended for free software support.
* The file may be copied, and distributed; however, reselling the
*  material is illegal
*////////////////////////////////////////////////////////////////////
* For ordering or technical information on these models, contact:
* National Semiconductor's Customer Response Center
*                7:00 A.M.--7:00 P.M.  U.S. Central Time
*                          (800) 272-9959
* For Applications support, contact the Internet address:
*  amps-apps@galaxy.nsc.com
*////////////////////////////////////////////////////////////
*LM741 OPERATIONAL AMPLIFIER MACRO-MODEL
*////////////////////////////////////////////////////////////
*
* connections:              non-inverting input
*                           |   inverting input
*                           |   |   positive power supply
*                           |   |   |     negative power supply
*                           |   |   |     |     output
*                           |   |   |     |     |
*                           |   |   |     |     |
.SUBCKT LM741/NS    1   2  99  50  28
*
```

Transient Analysis

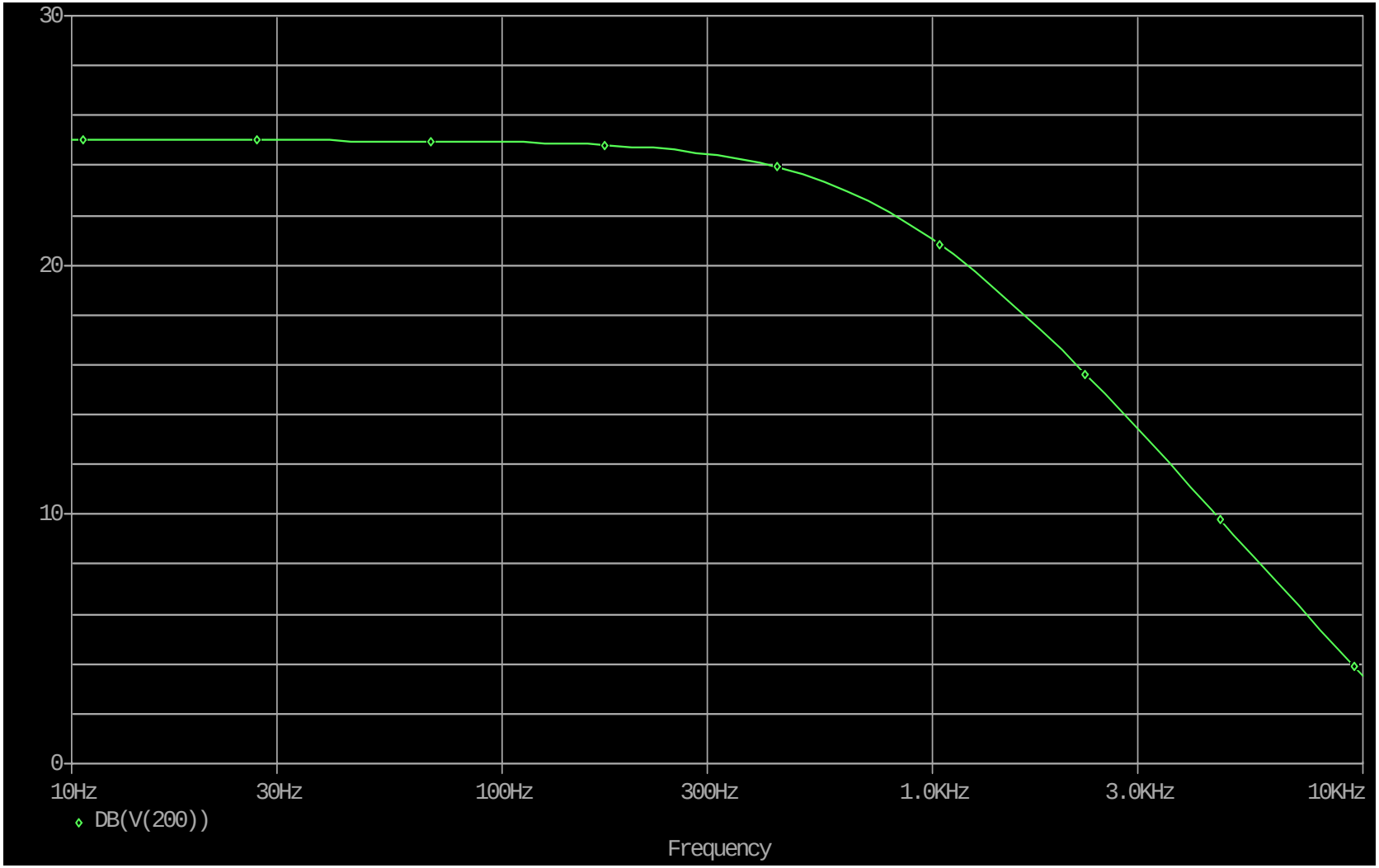
```
*      max step      Tend      print delay      max print step size
.tran 0.01ms        50ms       0ms               0.01ms
.probe
.end
```


20V
10V
0V
-10V
-20V
0s
10ms
20ms
30ms
40ms
50ms
60ms
70ms
80ms
V(200)
V(100)
Time

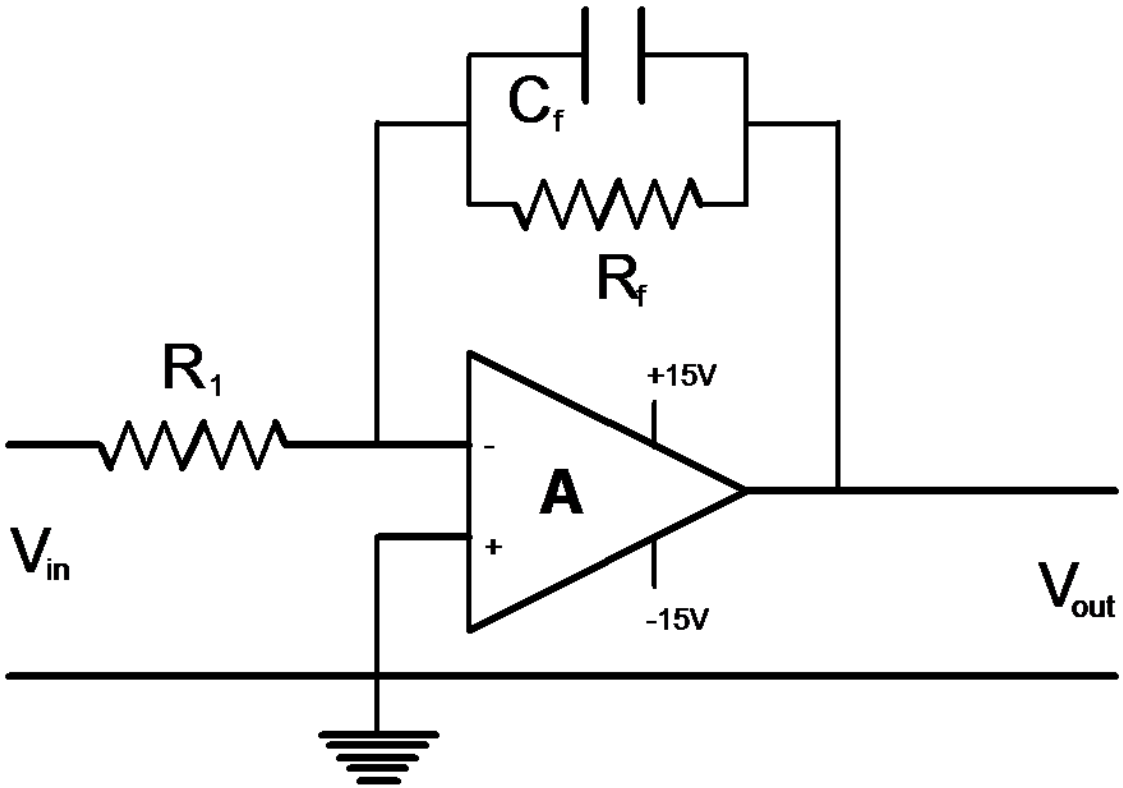
Frequency Response- Gain vs. freq.



Frequency Response- Gain in db



Low pass filter



The feedback circuit impedance

A parallel RC circuit has an impedance of

$$Z_p(s) = \frac{1}{\frac{1}{R_p} + sC_p} = \frac{K_p}{1 + s/\omega_p}$$

Summary

- We will use Pspice, Labview and the lab bench to investigate low, high and bandpass filters.