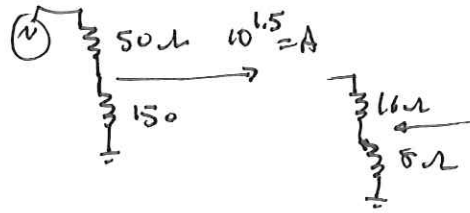
Problems: 35-40, 42-46

38 a)




$V_{in\,rms} = \frac{.2}{2\sqrt{2}} V = .0707 V$

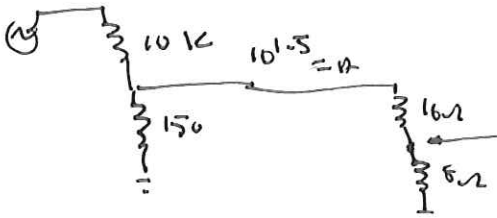
$V_{out} = V_{in} \frac{150}{200} 10^{1.5} \frac{8}{24} = .559 V$

$7.9$

$power = \frac{V_{out}^2}{R}$

$= \frac{(.559)^2}{8} = 39\,mW$

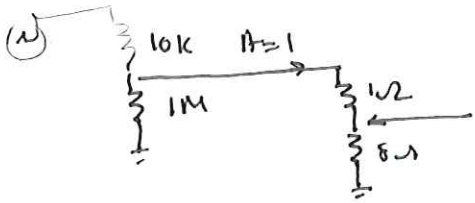
b)




$V_{out} = V_{in} \frac{150}{104} 10^{1.5} \frac{8}{24} = .0112 V$

$power = \frac{V_{out}^2}{12} = 15.2\,\mu W$

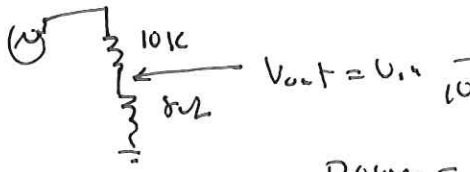
c)




$V_{out} = V_{in} \frac{1M}{1M+150} \cdot \frac{8}{9} = 62.9\,mV$

$Power = \frac{V_{out}^2}{R} = 494\,\mu W$

d)




$V_{out} = V_{in} \frac{8}{10,008} = 56.5\,\mu V$

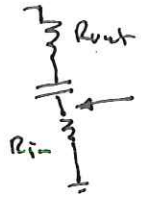
4

$power = \frac{V_{out}^2}{12} = 400\,pW$

32 a) $\left(\frac{R_{in}}{R_{in}+R_{out}}\right)^2 A3$

b) high freq $\Rightarrow$ cap = wire $\quad gain = \left(\frac{R_{in}}{R_{in}+R_{out}}\right) A2$

in general:




$\frac{R_{in}}{R_{in}+R_{out}-\frac{i}{\omega c}} = \frac{1000}{1100-\frac{i}{\omega c}} \xrightarrow{mag} \frac{1000}{\sqrt{(1100)^2+(\frac{1}{\omega c})^2}}$

5

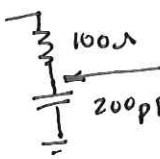
at 3dB terms equal to

$1100 = \frac{1}{\omega c}$

$f = \frac{1}{2\pi \cdot 1100 \cdot 10^{-7}}$

$= 1.45\,kHz$

c) at low freq $Z_c \to \infty \Rightarrow gain = A2$




$V_{out} = \frac{\frac{-i}{\omega c}}{R-\frac{i}{\omega c}} = \frac{1}{i\omega RC+1}$

↳ if $=1 \Rightarrow \sqrt{2}$

$f = \frac{1}{2\pi RC} = \frac{1}{2\pi \cdot 100 \cdot 200 \cdot 10^{-12}} = 7.96\,MHz$

(40) 


set R=0 (direct connect), measure Vout
adjust R until scope shows $\frac{1}{2}$ Vout
then $R = R_{in}$

4


set R=∞ (disconnect), measure Vout
adjust R until scope shows $\frac{1}{2}$ Vout
then $R = R_{out}$

(42) gain = −5 so $V_{out} = (-5)(1.5) = -7.5V$

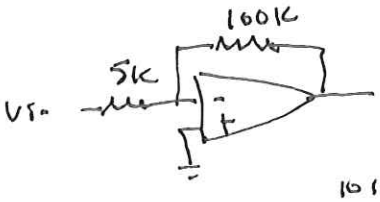
(V) = zero (golden Rule)

3

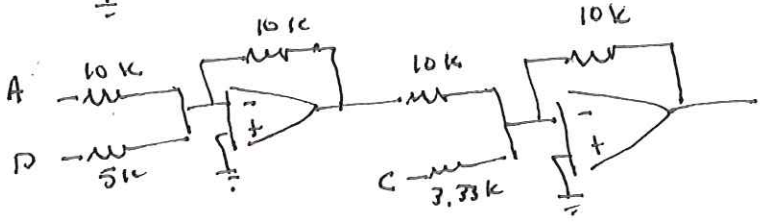
(A) = $\frac{1.5\,V}{10\,K\Omega} = .15\,mA$

(43) a) inverting: gain = $\frac{-25}{5} = -5$ $Z_{in} = 5K\Omega$

4 b) non invert: gain = $1 + \frac{25}{5} = 6$ $Z_{in} = \infty$

(44) 


2

(45) 


A + 2B − C

3

(46) a) $\frac{6\,V}{.1\,V} = 60$ b) $\frac{3\,mV}{10\,V} = 3 \times 10^{-4}$

4 c) $\frac{60}{3 \times 10^{-4}} = 200{,}000 \Rightarrow 20\log_{10}(200{,}000) = 106\,dB$