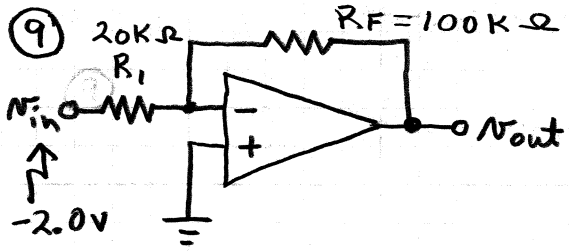
Answers - ECET 157

Ch. 30: 9, 12, 13, 16 & 20.

(9)



Inverting Amplifier: $V_{out} = -\frac{R_F}{R_1} \times V_{in}$

$= -\frac{100K}{20K} \times (-2.0V)$

$= \boxed{-10.0V}$

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(12) Same ckt as (9), except $R_1 = 7.5K\Omega$ and gain = -4.

$$\text{Gain} = -\frac{R_F}{R_1} = -4$$

$$\Rightarrow -\frac{R_F}{7.5K\Omega} = -4$$

$$\Rightarrow R_F = 4 \times 7.5K\Omega = \boxed{30K\Omega}$$

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(13) Non-Inverting Amplifier $\Rightarrow$ Gain $= 1 + \frac{R_F}{R_1}$

$R_F = 100K\Omega$, $R_1 = 20K\Omega$

a) Gain $= 1 + \frac{R_F}{R_1} = 1 + \frac{100K}{20K} = 1 + 5 = \boxed{6}$

b) Input goes straight into non-inverting input.

$\Rightarrow \boxed{R_{in} = 2M\Omega}$

c) $R_{out} = 75\Omega \,||\, (R_F + R_1) = 75\Omega \,||\, 120K\Omega$

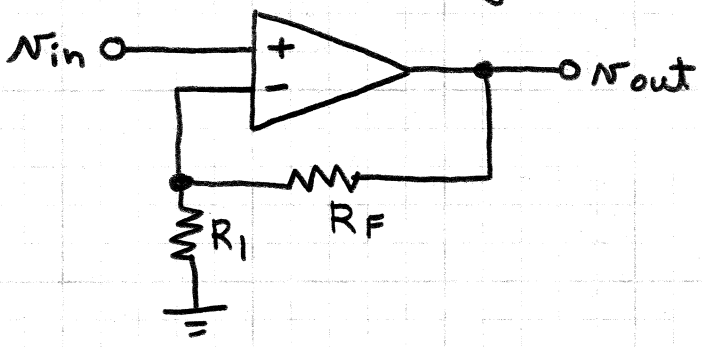
Op Amp's Z_{out}

$\approx 75\Omega$ since R_F & R_1 are so big.

(21) For $V_{in} = -2.0V$, $V_{out} = \left(1 + \frac{R_F}{R_1}\right) V_{in}$

$= \left(1 + \frac{100K}{20K}\right)(-2.0V) = \boxed{-12V}$

(16) Want non-inverting ckt with gain = 4.



$$\text{Gain} = 4 = 1 + \frac{R_F}{R_1} \Rightarrow \frac{R_F}{R_1} = 3$$

$$\Rightarrow R_F = 3 \times R_1$$

Pick <u>any</u> pair of resistors that satisfy this equation.

E.G., $R_F = 90K\Omega$ and $R_1 = 30K\Omega$.

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(20) Normally, $v_{out} = v_{in}$ for voltage follower ckt.

But with $v_{io} = 2mV$,

$$\boxed{v_{out} = v_{in} \pm 2mV}$$

<u>NOTE</u>: This is important. The offset may be (+) or (−). You don't know which unless you measure it!