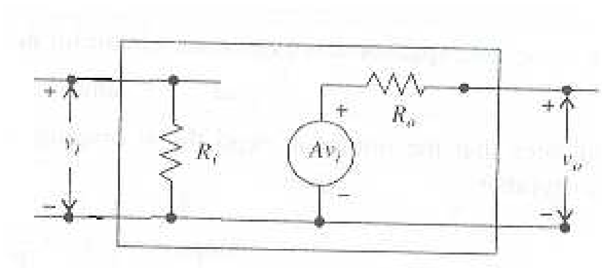
Expression for sweep error in Bootstrap sweep circuit:

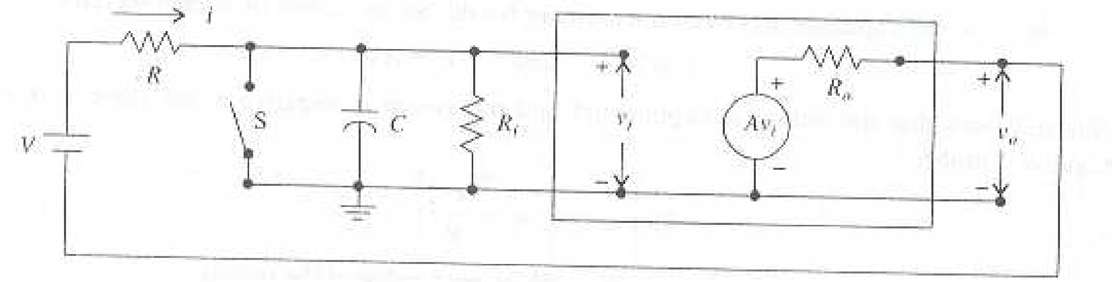
We know $e_s = \dfrac{V_s}{V_o(t=\infty)}$ ---------(1)

Equivalent circuit of voltage amplifier is,



In bootstrap sweep circuit , by replacing voltage amplifier with its equivalent circuit,

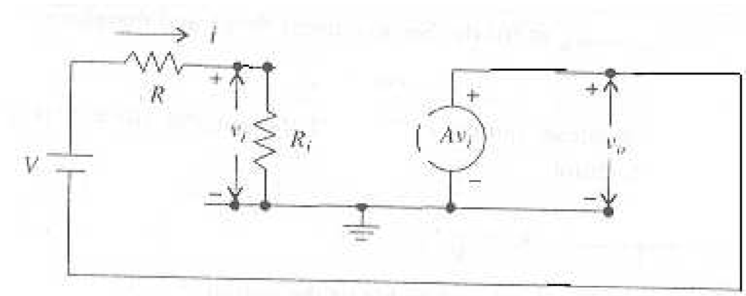
The resultant circuit is shown below



For an voltage amplifier , output resistance is low.

And at t = ∞ capacitor is replaced With an open circuit.

So by neglecting R_O and by replacing capacitor with an open circuit the above circuit is redrawn as shown below



From the circuit (at t = ∞), $V_O = AV_i$ -----(2)

Here $V_i = i\,R_i$ ----(3)

By applying KVL,

$$V - iR - iR_i + V_O = 0$$

$$i = \frac{V + V_O}{R + R_i} \text{------(4)}$$

From equations (2) (3) &(4),

$$V_O = A\left(\frac{V + V_O}{R + R_i}\right)R_i$$

$$V_O = \frac{AV\ R_i}{R + R_i(1 - A)} \text{-----(5)}$$

From equations (1) &(5) ,

$$e_S = \frac{V_S\left(R + R_i(1 - A)\right)}{AR_iV}$$

$$e_S = \frac{V_S}{AV}\left(\frac{R}{R_i} + (1 - A)\right)$$

If A =1 , then

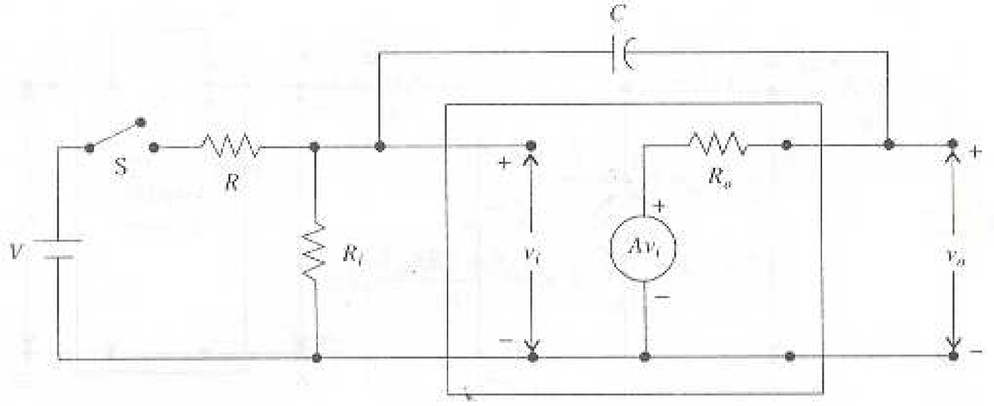
$$e_S = \frac{V_S}{V}\left(\frac{R}{R_i}\right)$$

Here sweep error is minimum when only input impedance of an amplifier is high.

Sweep error in Miller sweep circuit:

In miller sweep circuit , by replacing voltage amplifier with its equivalent circuit,

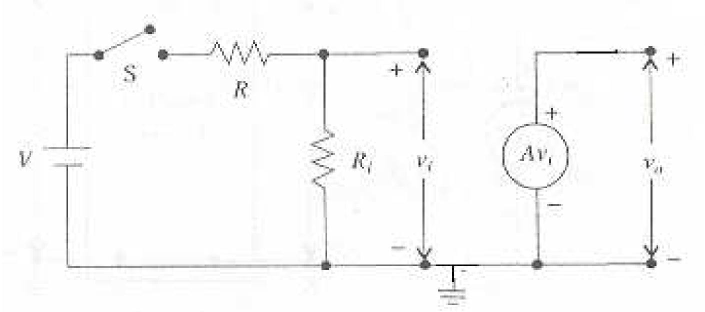
The resultant circuit is shown below



For an voltage amplifier , output resistance is low.

And at t = ∞ capacitor is replaced With an open circuit.

So by neglecting R_O and by replacing capacitor with an open circuit the above circuit is redrawn as shown below



From the circuit (at t = ∞), $V_O = AV_i$

Here $V_i = \frac{VR_i}{R+R_i}$

So output voltage at t =∞ is $V_O = \frac{AVR_i}{R+R_i}$

Therefore sweep error ,

$$e_S = \frac{V_S\left(R+R_i\right)}{AR_iV}$$

$$e_S = \frac{V_S}{AV}\left(\frac{R}{R_i}+1\right)$$

Here gain must be high. So sweep error is low.

In miller sweep circuit , to reduce sweep error input impedance of an amplifier

need not be high.