RISOLUZIONE 070417

1.

$$Av = 1+\frac{\frac{Rb}{1+s\,Rb\,Cb}}{\frac{Ra}{1+s\,Ra\,Ca}} = 1+\frac{Rb\,(1 + Ca\,Ra\,s)}{Ra\,(1 + Cb\,Rb\,s)}$$

2.

Il numeratore deve aumentare con la frequenza meno del denominatore, quindi deve essere CaRa < CbRb, cioè Ca compreso fra 0 e 75pF

3.

$$Vbe1 = VT\,Log\left[\frac{Ic1}{IS}\right] = 700mV$$

$$Vbe2 = VT\,Log\left[\frac{Ic2}{IS}\right] = 796mV$$

$$R3=\frac{Vbe1 + Ic1\,R4}{Ic2} = 500\Omega$$

$$Vc1 = Vbe1 + Vbe2 + Ic1\,R4 = 1.8V$$

$$VgOP = Vc1 + (Ic1 - \frac{Vcc - Vc1}{R1})\,Rg = 2V$$

4.

$$R2 = \frac{Vcc - VgOP}{Ic2} = 1.5k\Omega$$

5.

$$gm1 = \frac{Ic1}{VT} = 1.92mS$$

$$gm2 = \frac{Ic2}{VT} = 76.9mS$$

$$Rin_{ca} = \frac{R1\,(1 + gm1\,R4)\,(1 + gm2\,R3)}{(1 + gm1\,R4)\,(1 + gm2\,R3) + gm1\,R1\,gm2\,R3} = 6.56k\Omega$$

$$Av_{ca}=-\frac{gm2\,R2}{1 + gm2\,R3} = -2.92$$

$$Av = \frac{Rin_{ca}}{Rin_{ca} + Rg}\,Av_{ca}; = -1.66$$

6.

Netlist:

```
.temp=28.57
.options tnom=28.57
.model nmod npn is=0.1f bf=1e9
Vcc vcc 0 5
Vg g 0 2 ac 1
Rg g 1 5k
R1 vcc 1 350k
Q1 1 2 3 nmod
R4 3 0 6k
R2 vcc o 1.5k
Q2 o 1 2 nmod
R3 2 0 500
.ac dec 100 1e-3 1e12
.op
.probe
```