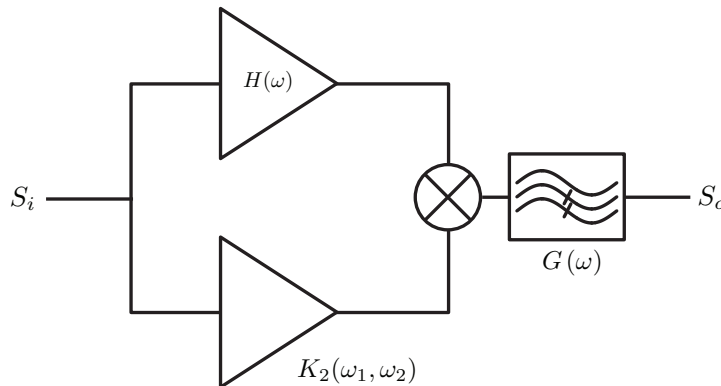
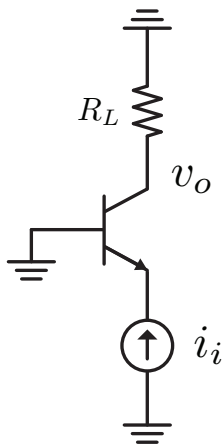


Problem Set 4  
Due Monday March 30, 2009

1. Compute the first three Volterra series coefficients for the system shown below in terms of the Volterra coefficients of  $H$ ,  $K_2$  and  $G$ .  $H$  and  $G$  are linear systems whereas  $K_2$  is described by a sum of first and second order non-linearity.



2. Calculate the first three Volterra coefficients of  $v_o = F[i_i]$  for the current driven common-base amplifier shown below (AC schematic). Compute  $IM_3$  in the output when each output tone has voltage  $v_o = 100$  mV rms for a two input signals of equal amplitude and approximately equal frequency of 2 GHz. Make use of the approximation that the signal frequency is much less than  $f_T$ . Verify using SPICE (.disto and .tran).



Note: Bias current  $I_{CQ} = 3\text{mA}$ ,  $\tau_F = 5\text{ps}$ ,  $R_L = 200\Omega$  and  $C_{je} = 76\text{fF}$  (assume constant). Neglect effects of DC  $\beta$ ,  $r_b$ , and  $C_\mu$ .