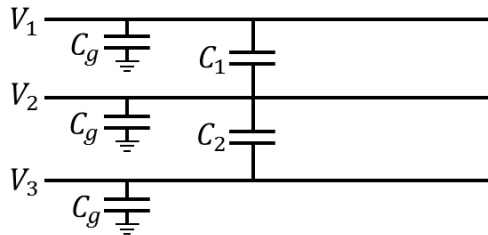(1) **[Crosstalk, 15 points]** Express $V_3$ as a function of $V_1, C_1, C_2, C_3$ for the following capacitive network.
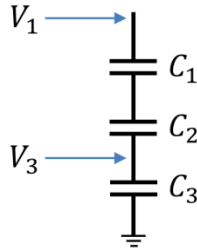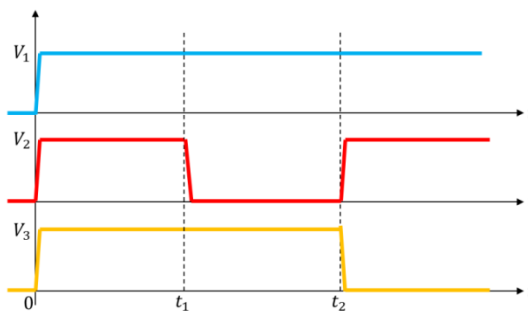


The capacitance of the series capacitor composed of $C_1$ and $C_2$ is $C_{1,2} = \frac{C_1 C_2}{C_1 + C_2}$.

Thus, $V_3 = \frac{C_{1,2}}{C_{1,2}+C_3} V_1 = \frac{\frac{C_1 C_2}{C_1+C_2}}{\frac{C_1 C_2}{C_1+C_2}+C_3} V_1 = \frac{C_1 C_2}{C_1 C_2 + C_2 C_3 + C_3 C_1} V_1 = \frac{1}{1+\frac{C_3}{C_1}+\frac{C_3}{C_2}} V_1$

(2) **[Crosstalk, 15 points]** The following shows three nets and their ground and coupling capacitances.



The following shows the waveforms of the three nets.



Compute the effective capacitances of $V_2$ at time $t = 0, t_1, t_2$.

| | $t = 0$ | $t = t_1$ | $t = t_2$ |
|---|---|---|---|
| $V_2$ | $C_g$ | $C_g + C_1 + C_2$ | $C_g + C_1 + 2C_2$ |