1. Use the open-circuit time constant method to estimate the high-frequency pole for the following circuit. Do not use the Miller approximation. (25 pts)
2. Use the short circuit time constant method to estimate the dominant low-frequency pole for the circuit below. The transistor has \( g_m = 5.6 \times 10^{-3} \, \text{A/V} \). (25 pts)
3. The circuit shown below has identical transistors biased at 0.5 mA. Parameters are $r_b = 120\Omega$, $r_e = 15k\Omega$, $V_A = 180V$, $C'_e = 40pF$ and $C'_e = 4pF$.

(a) Draw the high-frequency equivalent circuit. (10 pts)

(b) Determine the upper half-power frequency for the amplifier. (25 pts)
4. Estimate the mid-band gain and write down an expression for the gain as a function of frequency for the transistor amplifier shown below. Use $g_m = 10 mA/V$ and $C_{gs} = C_{gd} = 4 pF$. (15 pts)