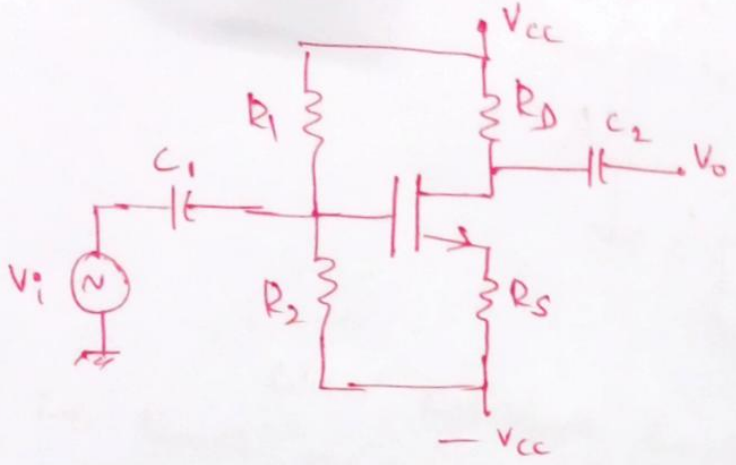
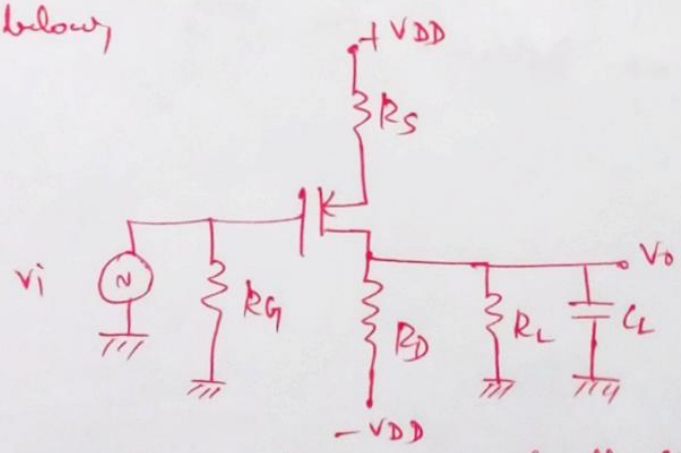
5. Consider the circuit below,



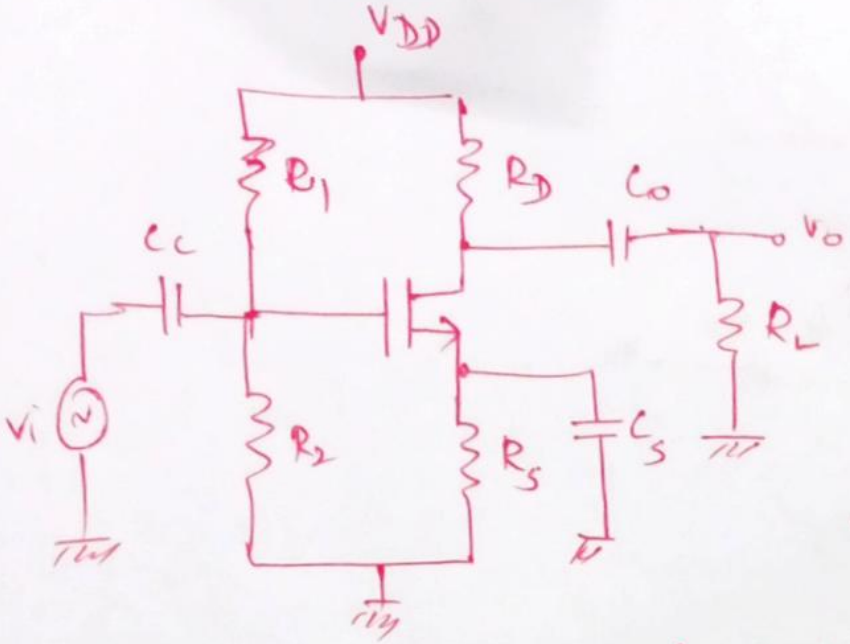
1. Derive the Q point and draw the load line
2. Derive the small signal voltage gain.
3. Let $V_{cc} = 10V$, $R_1 = 100k\Omega$, $R_2 = 50k\Omega$, $R_D = 5k\Omega$, $R_S = 1k\Omega$, $V_T = 1V$, $K_n = 0.5\ mA/V^2$, calculate ~~Point~~) part (1) and part (2)

6. Consider the Common Source Circuit with load capacitor below,



1. Draw & Derive the Small signal voltage gain, Maximum Small signal voltage
2. Let $R_D = 10K$, $R_L = 100K$, $R_G = 1K$, $V_{DD} = 20V$, $C_L = 1\mu F$ Calculate the Maximum voltage gain. $K_n = 1\ mA/V^2$

7.



1. Derive the large signal equivalent model
2. Draw the small signal equivalent circuit and find the expression for midband voltage gain.
3. Find the input resistance, output resistance and small signal voltage gain.

8. For a n channel MOSFET, $k_n = 0.2\ mA/V^2$, $V_T = 1V$, $\lambda = 0$, $C_{gd} = 0.02\ pF$, $C_{gs} = 0.25\ pF$. The device is biased at $I_{DQ} = 0.4\ mA$. Determine the unity gain frequency.