Problem T4
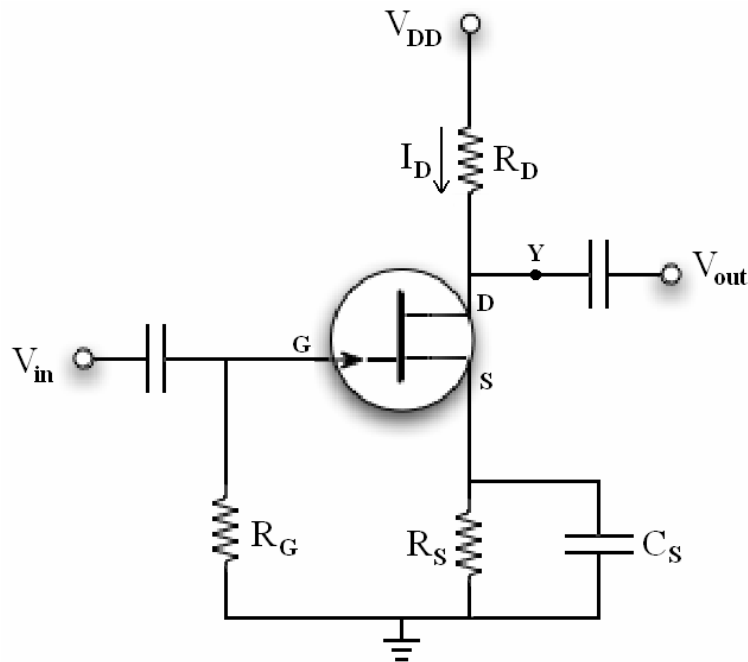
Consider the following common source JFET amplifier circuit. Assume that $V_{DD} = 10$ V and that the average value of I_D is 4.0 mA. Moreover, assume that the voltage difference between the gate and source is $V_{GS} = -1.5$ V and that the transconductance under these conditions is $g_m = 1.5$ mhos.

(a) Calculate the value of R_D will that that will result in gain of $|\Delta V_D / \Delta V_G| = 500$.

(b) Assume that R_G is sufficiently small so that the average voltage at the gate is approximately zero. Find the value of R_S necessary to give $V_{GS} = -1.5$ V.

(c) Calculate an appropriate value for C_S if the minimum operating frequency is 100 Hz.

(d) Given your values of R_D and R_S, what is the average voltage at point Y.

(e) Assume that the input and output capacitors are sufficiently large to pass 100% of the AC signal at $\omega = 1000$ radians/s. Given that $V_{in} = 0.002 \cos \omega t$, plot V_{out} and I_D as a function of time t (using your values of R_D and R_S).