Analyze the circuits below based on a long-channel NFET transistor biased in saturation. Assume the maximum supply is 1 V and the voltage threshold is 0.5V. Assume $L = 400$nm.

a. Consider that $\mu_n = 1000 \frac{cm^2}{V \cdot s}$. Find the maximum $f_T$ when the inductor is removed from either circuit. (20)

b. What is the maximum $f_T$ when a series inductance is connected to source of the transistor? For this problem, consider the inductor has a quality factor $Q$ of 10. (15)

c. What is the maximum $f_T$ when a shunt inductance is connected between the gate and source? For this problem, consider the inductor has a quality factor $Q$ of 10. (15)