I) Shown below is an amplifier. The equation for the FET is given below. (This equation is not the same as in the textbook.)

\[ I_{DS} = 0.1(V_{GS} - 1)(1 + 0.2V_{DS}) \]

Find \( I_{DS} \) and \( V_{DS} \) and then find \( g_m, r_o \), and the \( \text{GAIN} = \frac{v_o}{v_i} \)

II) The characteristics of the MOSFET in figure 1a are shown in figure 1b. Use the characteristics in figure 1b, not the equations in your textbook, to answer the following questions.

A) From figure 1b estimate \( g_m \) and \( r_o \) for the FET in the saturation region. Include calculations or an explanation with your answer.

B) Find the values for \( R_g, R_d, VDD \) and \( VGG \) so that \( Z_{IN} = 100k \), \( Z_{OUT} = 5k \), \( I_d = 2 \text{ mA} \) and \( V_{DS} = 5 \)

C) Find the \( \text{GAIN} = \frac{v_o}{v_i} \)
III) Shown below is a source follower. Find Zin, Zout, and the \( \text{GAIN} = \frac{v_o}{v_i} \), given \( g_m = 0.01 \) and \( r_o = \infty \).

IV) For figure B find the following:
   a. Find \( I_{DQ1} \) and \( I_{DQ2} \)
   b. Find Zin and Zout
   c. Find the gain = \( \frac{v_o}{v_i} \)

\[
I_D = 0.02(V_{GS} - 2)^2
\]