4) $I_{D1} = I_{D2} = \frac{I_{SS}}{2} = \frac{0.2\,mA}{2} = 0.1\,mA$

a) $I_D = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} (V_{GS} - V_{th})^2$

$0.1 \times 10^{-3} = \frac{1}{2} \times 0.4 \times 10^{-3} \times 12.5 (V_{OV})^2$

$\frac{0.1 \times 2}{0.4 \times 12.5} = (V_{OV})^2$

$V_{OV} = \sqrt{0.04}$

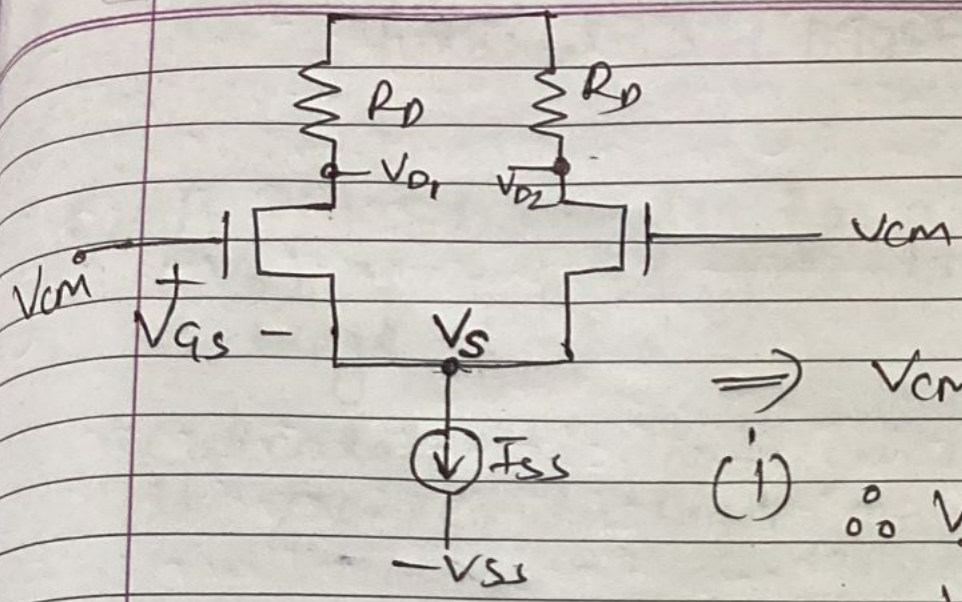
$\boxed{V_{OV} = 0.2\,V}$

$V_{OV} = V_{GS} - V_{th}$

$0.2\,V = V_{GS} - 0.5\,V$

$\boxed{V_{GS} = 0.7\,V}$

0.1mA



$\Rightarrow V_{CM} - V_{GS} - V_S = 0.$

(i) $\therefore V_S = V_{CM} - V_{GS}.$

$V_S = 0 - 0.7$

$\boxed{V_S = -0.7V}$

(ii) $I_{D1} = I_{D2} = \frac{I_{SS}}{2} = \frac{0.2\,mA}{2} = 0.1\,mA$

(iii) $V_{D1} = V_{D2} = V_{DD} - I_D R_D.$

$= V_{DD} - \frac{I_{SS}}{2} R_D$

$= 1 - 0.1\,mA \times 10K\Omega$

$\boxed{V_{D1} = V_{D2} = 0\,V}$

c.) $\boxed{V_{CM_{max}} = V_{DD} - \frac{I_{SS}}{2} R_D + V_{th}}$

$= 1 - 1 + 0.5$

$\boxed{V_{CM} = 0.5V}$