

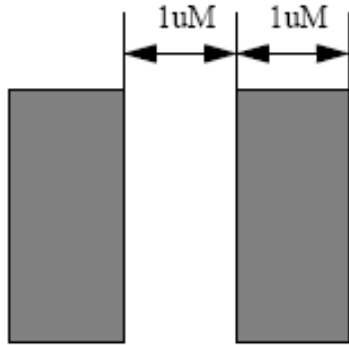
Homework 2

Assigned 9/24; Due: October 6 start of class

You are required to work on the homework on your own. Please be legible and state all assumptions clearly. Show all work in order to receive partial credit.

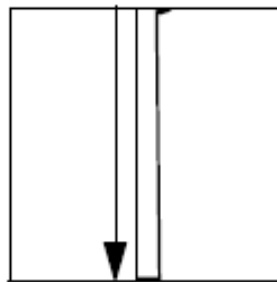
Problem 1(25 points)

Football Coach David Cutcliffe was trying to figure out how many football fields lengths of metal wire can fit into a 10mm x 10mm die which uses 8 layers of metal. The drc rules for minimum spacing metal are shown below:



Metal Spacing and widths

Hint assume wiring as such versus perimeter wiring

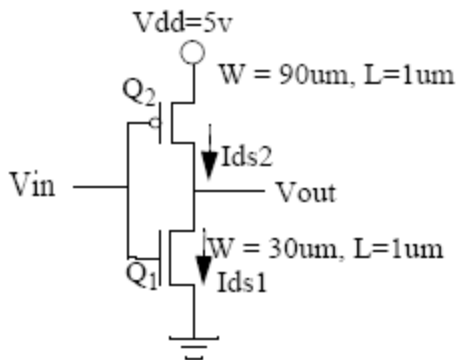


Note: assume for this calculation 1 yard = 1 meter, 100 yards in 1 football field.
Please leave answer using 2 significant figures of FFL units (Football Field Lengths)

Problem 2 [25]

- Textbook, Page 266, Problem 4.6 (8pts)
- Textbook, Page 269, Problem 4.20 (8pts)
- Textbook, Page 269, Problem 4.27. (7pts)

Problem 3(25 pts) See inverter circuit below:



$$\begin{aligned} U_n C_{ox} &= 90 \mu\text{A}/\text{V}^2 \\ U_p C_{ox} &= 30 \mu\text{A}/\text{V}^2 \\ V_{tn} &= .8\text{v} \\ V_{tp} &= -.9\text{v} \\ V_{dd} &= 5\text{v} \end{aligned}$$

- Draw input output curves (input on x-axis and output on y-axis) for $0 < V_{in} < V_{dd}$ (5 pts)
- Show regions of operation (cutoff, lin, sat) for both the p and n devices (5 pts)
- Derive I_{dd} for all region of operations when devices are on only (15 pts)
For example $I_{ds} = F(V_{in}, \dots)$ when $1\text{v} < V_{in} < 2\text{v}$