Gabriel Emerson gte0002 | Buffer HW1 | Due 4/1

1.) $K_n = 100\frac{mA}{V^2}$ $K_p = 40\frac{mA}{V^2}$ $V_{TN} = 0.6V$ $V_{TP} = -0.6V$

$C_L = 40pF$ $C_0 = 50fF = 0.05pF$

$N = \ln(C_L/C_0) = \ln(40/0.05) = 6.68461$

N must be 6 or 7

$N = 6$ since we round down

$B = (40/0.05)^{1/6} = 3.04683 \approx 3.05$

Relative sizes are: 1, 3.05, 9.30, 28.37, 86.54, 263.94

Each inverter has delay $\approx 3.05\tau_0$

Total delay = $6(3.05) = 18.3ns$

Size 7: $N = 7$

$B = 2.5985$

Each inverter $\approx$ 1, 2.5985, 6.75, 17.54, 45.59, 118.47, 307.85

Each is $\approx 2.5985\tau_0$

Total delay = $7(2.5985) = 18.189$

$N = 7$ has lower buffer time

2.) $C_0 = 20fF = 0.02pF$ $C_L = 80pF$

$N = 8.29405 \approx 8$

$B = (80/0.02)^{1/8} = 2.82$

Relative sizes: 1, 2.82, 7.95, 22.43, 63.24, 178.34, 502.92, 1418.22

Each has delay $2.82\tau_0$

Total delay = $8(2.82) = 22.56ns$

$N = 9$

$B = (80/0.02)^{1/9} = 2.51$

Relative sizes: 1, 2.51, 6.3, 15.81, 39.69, 99.63, 250.06, 627.65, 1575.4

Each delay is $2.51\tau_0$

Total delay = $9(2.51) = 22.59ns$

$N = 8$ has lower total delay