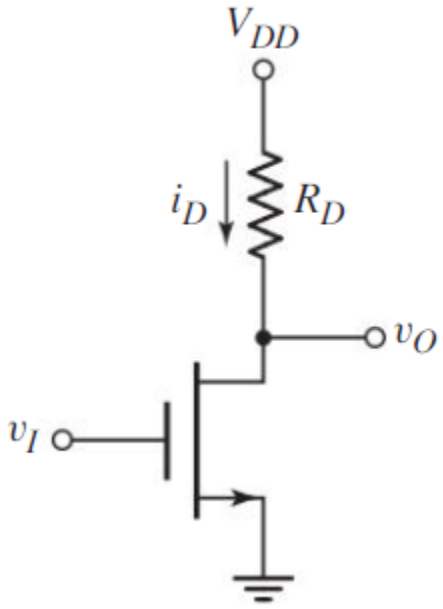
NMOS Inverter

Exercise 1



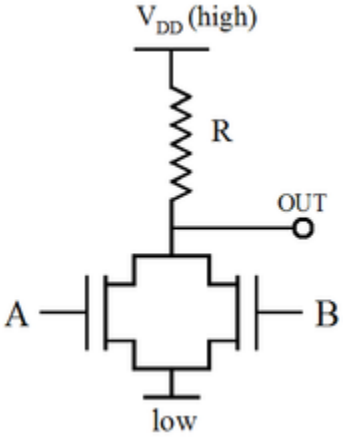
For the NMOS Inverter shown- $V_{DD} = 6\ V$, $V_{TN} = 0.3\ V$
$V_{in}(high) = 6V, V_{in}(low) = 0\ V, K_n = 0.2\ A/V^2$

a) If the **average** power dissipation is $1.1654\ W$, find the value of R_D.
b) Find the drain current for maximum power dissipation of the inverter.
c) Find the transition point.
d) Find the power dissipation at the transition point.
e) If the output voltage is $4.2\ V$, find the input voltage at the gate.

a) 15 Ω
b) 0.388 A
c) 1.56 V
d) 1.896 W
e) 1.07 V

NMOS NOR Gate

Exercise 2

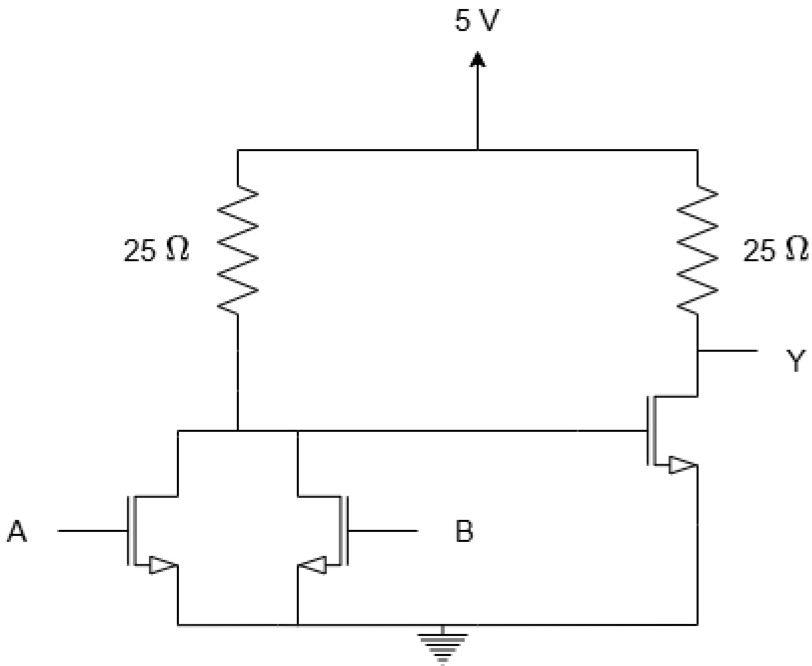


For the given NMOS NOR gate- $V_{in}(High) = V_{DD} = 5\ V$
$V_{in}(Low) = 0\ V, V_{TN_A} = 0.25\ V, V_{TN_B} = 0.3\ V, K_{n_A} = 0.4\ A/V^2$
$K_{n_B} = 0.5\ A/V^2 \quad R = 20\ \Omega$

a) Find the low output threshold.
b) Find the average power dissipation.
c) If a new NMOS is used for 'B' such that the drain currents are equal for A=1 & B=1, find it's K'_{n_B}, given, $V'_{TN_B} = V_{TN_B} = 0.3\ V$

a) $0.063\ V$
b) $0.9285\ W$
c) $0.401\ A/V^2$

Exercise 3



For the given circuit-
$V_{TN_A} = V_{TN_B} = V_{TN_Y} = 0.3\ V$,
$K_{n_A} = K_{n_B} = K_{N_Y} = 0.5\ A/V^2$

a) What logic function does the circuit implement?
b) Find the maximum power dissipation.
c) What is the higher threshold of output voltage?