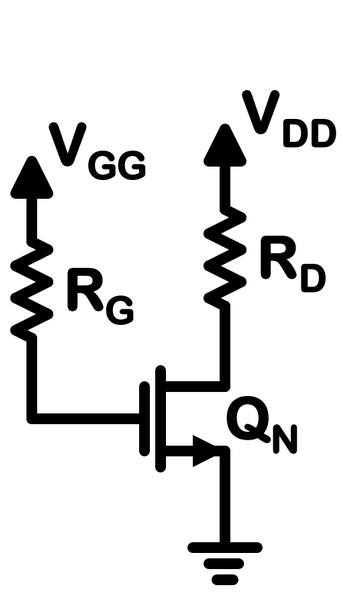
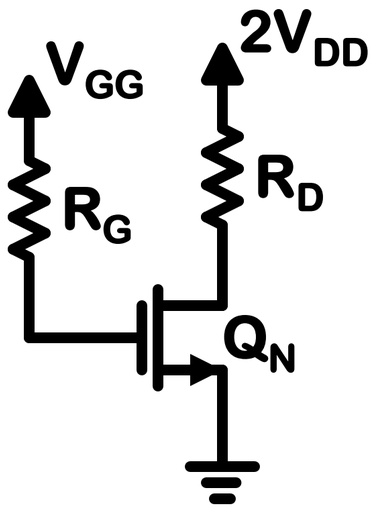
For each circuit B through H, follow the procedure on slide #3 to find the drain current, i_D, and verify the mode which is given for each circuit.

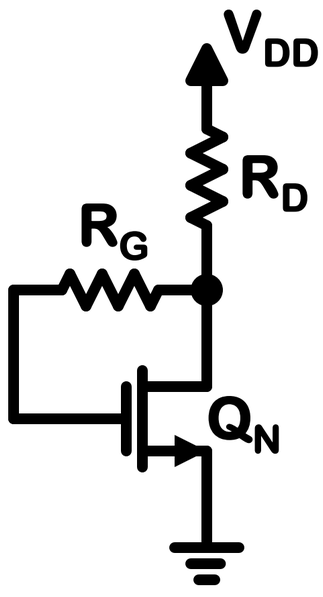
For circuit I (not 1), stop at step 3a.



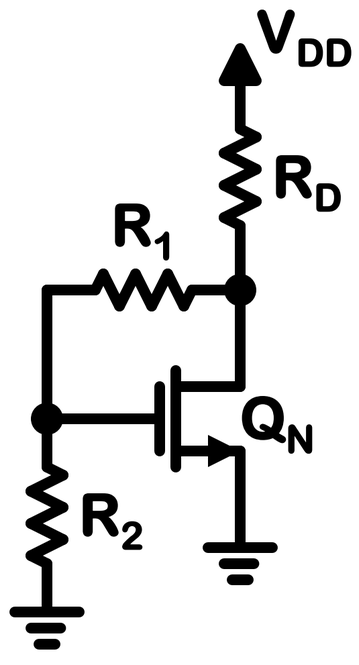
A: Triode



B: Saturation

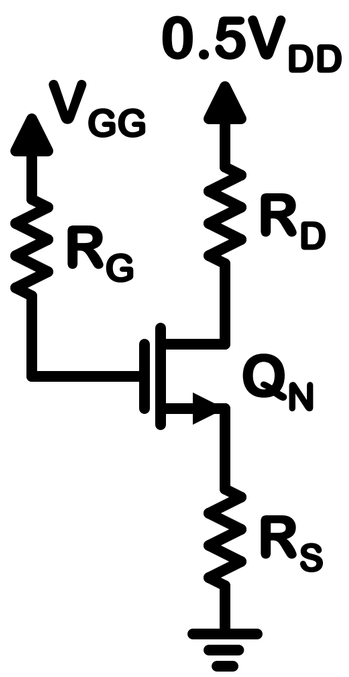


C: Saturation

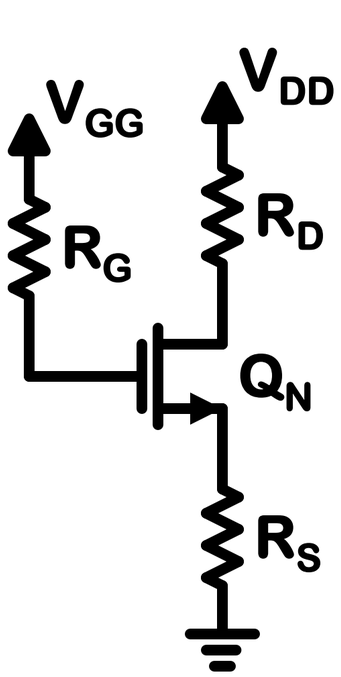


D: Saturation

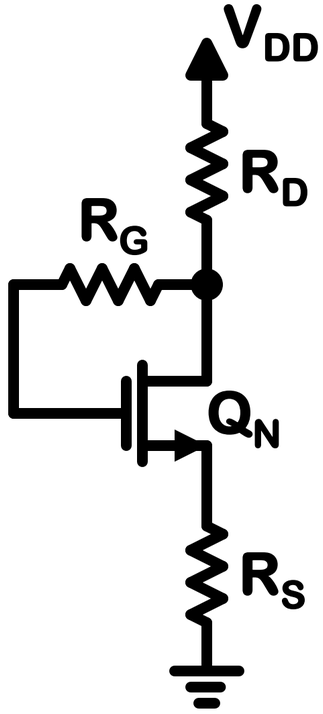
$V_{DD} = 6V$
$V_{GG} = 4V$
$R_G = 10k\Omega$
$R_D = 500\Omega$
$R_S = 200\Omega$
$R_1 = 200\Omega$
$R_2 = 300\Omega$
$k_n = 2\ mA/V^2$
$V_{tn} = 1V$



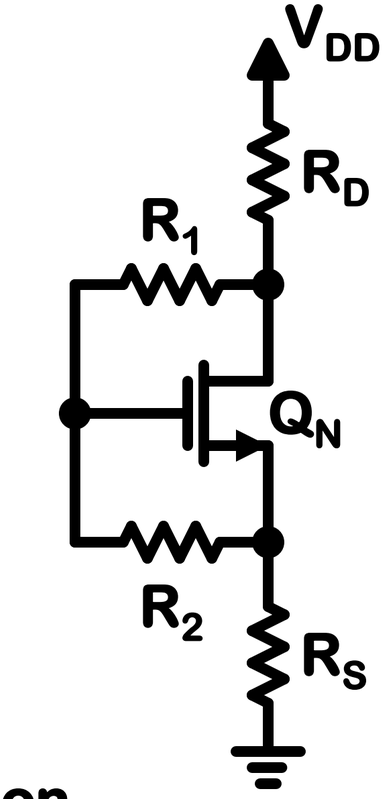
E: Triode



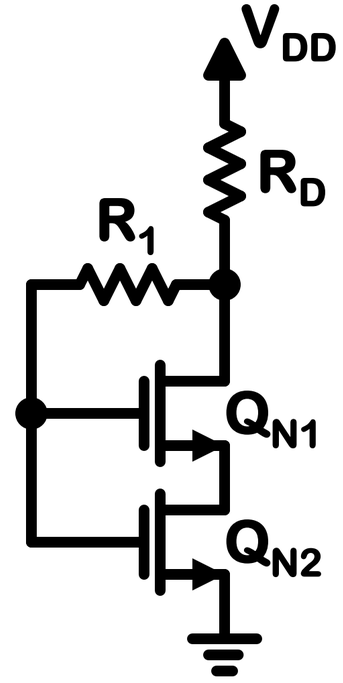
F: Saturation



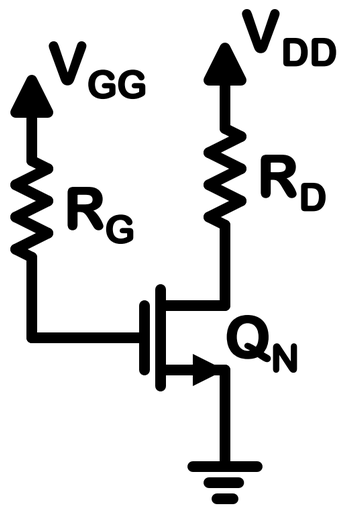
G: Saturation



H: Saturation



I:
Q_{N1}: Saturation,
Q_{N2}: Triode



1. Triode

2. Enforce (device equation)

$i_D = 0.002(v_{GS} - V_{tn} - v_{DS}/2)v_{DS}$

3. Solve

a. Circuit Equations

$v_{GS} = 4V$

$i_D = (6 - v_{DS})/500$

b. Solve

$(6 - v_{DS})/500 = 0.002(4 - 1 - v_{DS}/2)v_{DS}$

$6 - v_{DS} = 3v_{DS} - 0.5v_{DS}^2$

$0.5v_{DS}^2 - 4v_{DS} + 6 = 0$

$v_{DS} = 4 +/- \text{sqrt}(16 - 12) = 6V \text{ or } 2V \ldots \text{Choose } 2V$

$i_D = (6 - 2)/500 = 4/500 = 8 \text{ mA}$

4. Check

$v_{GS} - V_{tn} > 0$, Yes

$v_{DS} < v_{GS} - V_{tn}$, Yes