EXERCISES

4.4 An enhancement-type NMOS transistor with $V_t = 0.7$ V has its source terminal grounded and a 1.5-V dc applied to the gate. In what region does the device operate for (a) $V_D = +0.5$ V? (b) $V_D = 0.9$ V? (c) $V_D = 3$ V?

Ans. (a) Triode; (b) Saturation; (c) Saturation

4.5 If the NMOS device in Exercise 4.4 has $\mu_n C_{ox} = 100\ \mu A/V^2$, $W = 10\ \mu m$, and $L = 1\ \mu m$, find the value of drain current that results in each of the three cases (a), (b), and (c) specified in Exercise 4.4.

Ans. (a) 275 μA; (b) 320 μA; (c) 320 μA

4.6 An enhancement-type NMOS transistor with $V_t = 0.7$ V conducts a current $i_D = 100\ \mu A$ when $v_{GS} = v_{DS} = 1.2$ V. Find the value of i_D for $v_{GS} = 1.5$ V and $v_{DS} = 3$ V. Also, calculate the value of the drain-to-source resistance r_{DS} for small v_{DS} and $v_{GS} = 3.2$ V.

Ans. 256 μA; 500 Ω