PROBLEMS

4-1. An n-channel JFET is described by the following parameters:

$I_{DSS} = 4.5$ mA, $V_{PO} = -3.6$ V.

a. If the JFET is in saturation, what gate-to-source voltage V_{GS} is necessary to achieve a drain current of 2.6 mA?

b. What is the minimum V_{DS} that will satisfy the conditions stated in part a?

c. If $V_{DS} = 2$ V, what gate-to-source voltage is necessary to achieve the same drain current?

4-2. A p-channel JFET is described by the following parameters:

$I_{DSS} = -4.0$ mA, $V_{PO} = +2.8$ V.

a. If the JFET is in saturation, what source-to-gate voltage V_{SG} is necessary to achieve a drain current of -1.8 mA?

b. What is the minimum V_{SD} that will satisfy the conditions stated in part a?

c. If $V_{SD} = 1.5$ V, what gate-to-source voltage is necessary to achieve the same drain current?

4-3. The parameters for a given JFET are

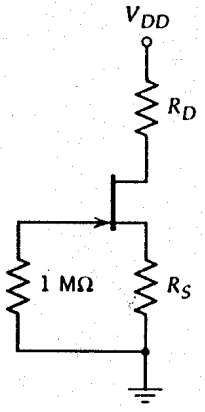
$I_{DSS} = 7.5$ mA, $V_{PO} = -4$ V.

The JFET is to be biased at

$I_D = 2$ mA, $V_{DS} = 6$ V,

with the circuit topology as shown.

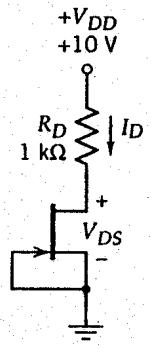
Determine the values of R_D and R_S to complete the design if $V_{DD} = 20$ V.



4-4. Given the n-channel JFET circuit shown. If the JFET is described by

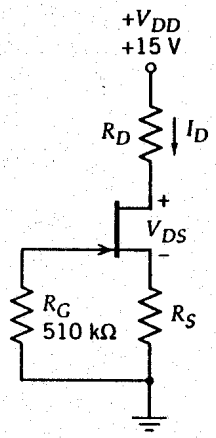
$V_{PO} = -2.5$ V and $I_{DSS} = 4$ mA,

find I_D and V_{DS}.



4-5. Complete the design of the n-channel JFET circuit shown for $I_D = 3$ mA and $V_{DS} = 5$ V. The JFET parameters are

$I_{DSS} = 7$ mA, $V_{PO} = -2.5$ V.



4-6. An n-channel, depletion-type MOSFET is described by the following parameters:

$I_{DSS} = 8.2$ mA, $V_{PO} = -3.1$ V.

a. If the NMOSFET is in saturation, what gate-to-source voltage V_{GS} is necessary to achieve a drain current of 4.0 mA?

b. What is the minimum V_{DS} that will satisfy the conditions stated in part a?

c. If $V_{DS} = 2$ V, what gate-to-source voltage is necessary to achieve the same drain current?

d. What is the output resistance of the NMOSFET at the conditions of part c?

4-7. An n-channel MOSFET has the following characteristics:

$V_{PO} = -3$ V, $V_A = 170$ V, $I_{DSS} = 8$ mA.