3-3 (1) $U_{GS} = -1V \qquad U_{DS} = 3V$

$\qquad U_{GS} - U_{GS(off)} = 4V > U_{DS} \qquad$ 可变电阻区

(2) $\qquad U_{GS} = -2V \qquad U_{DS} = 4V$

$\qquad U_{GS} - U_{GS(off)} = 3V < U_{DS} \qquad$ 小恒流区

(3) $\qquad U_{GS} = -2V, \ U_{DS} = 2V$

$\qquad U_{GS} - U_{GS(off)} = 3V > U_{DS} \qquad$ 可变电阻区

(4) $\qquad U_{GS} = -6V, \ U_{DS} = 10V.$

$\qquad U_{GS} < U_{GS(off)} \qquad$ 截止区

3-4 a. 源极缺少电阻提供负偏压, $U_{GS} = 0$, 使静态漏极电流过大, 动态范围过小

b. 没有漏极电阻, 使交流输出信号到地短路, u_o 无法取出

c. 可以正常放大

d. 自给偏压共源放大电路, 只适用于耗尽型和结型场效应管, 图中
为绝缘栅型N沟道增强型场效应管

3-7 (1) $I_{DQ} = I_{DSS} \left[1 + \frac{U_{GSQ}}{U_{GS(off)}}\right)^2 = 2mA \times \left(1 - \frac{-2V}{-4V}\right)^2 = 0.5mA$

$\qquad U_{GSQ} = U_{GQ} - U_{SQ} = -I_D R_{S1}$

$\qquad R_{S1} = \frac{-U_{GSQ}}{I_D} = \frac{2V}{0.5mA} = 4k\Omega$

(2) $\quad U_{DS} \geqslant U_{GS} - U_{GS(off)}$

$\qquad U_{DSmin} = (-2)V - (-4)V = 2V.$

$\qquad\qquad I_D(R_{S1} + R_D + R_{S2max}) = V_{DD} - U_{DSmin}$

$\qquad R_{S2max} = \frac{V_{DD} - U_{DSmin} - I_D \times (R_{S1} + R_D)}{I_D} = 22k\Omega$

(3) $g_m = -\frac{2I_{DSS}}{U_{GS(off)}}\left(1 - \frac{U_{GS}}{U_{GS(off)}}\right) = -\frac{2 \times 2}{-4}\left(1 - \frac{-2}{-4}\right) = 0.5mS$

$\qquad A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-g_m \dot{U}_{gs} R_D}{\dot{U}_{gs} + g_m \dot{U}_{gs}(R_{S1} + R_{S2})} = -0.36$

3-11. $\quad A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{g_m \dot{U}_{gs} R'_L}{\dot{U}_{gs} + g_m \dot{U}_{gs} R'_L} = 0.857 \qquad R'_L = R_S \| R_L$

$\qquad R_i = R_G + R_{G1} \| R_{G2} = 2.075 M\Omega$

$\qquad R_o = R_S \| \frac{1}{g_m} = 0.92 k\Omega$