UNIVERSIDAD CARLOS III DE MADRID

Analog integrated circuits design exercises

Integrated Circuits and Microelectronics

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Exercise 1

The figure shows the physical scheme of an amplifier stage.
- **a)** Draw the transistor scheme and indicate the aspect ratio W/L for each transistor.
- b) Calculate the drain current through each transistor
- c) Obtain Vo/Vi the amplifier gain
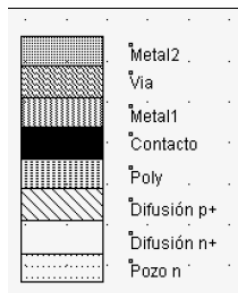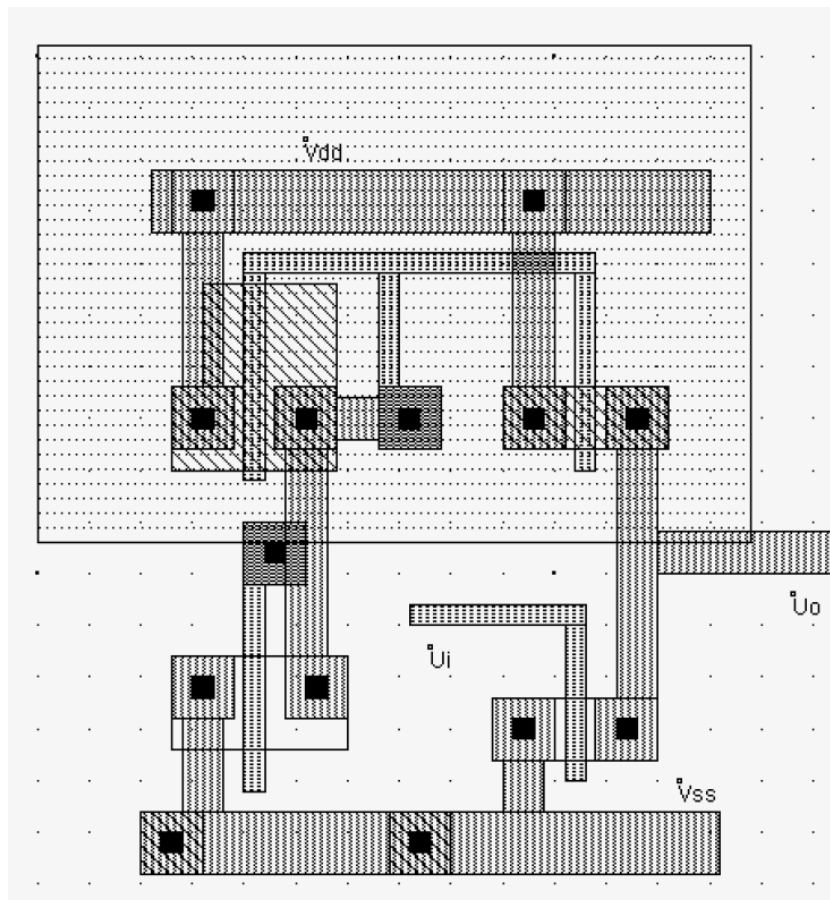
Data:

$k_n = \mu_n C_{ox} = 120\ \mu A/V_2$

$k_p = \mu_p C_{ox} = 50\ \mu A/V_2$

$\lambda_n = \lambda_p = 0.1\ V_{-1}$

$|V_{tn}| = |V_{tp}| = 1V$

$V_{dd} = 5\ V$

$V_{ss} = 0\ V$

Exercise 2

The figure shows the physical scheme of an amplifier of two stages.
 a) Draw the transistor scheme and indicate the aspect ratio W/L for each transistor.
 b) Calculate the drain current through each transistor and the current supplied by the source at a
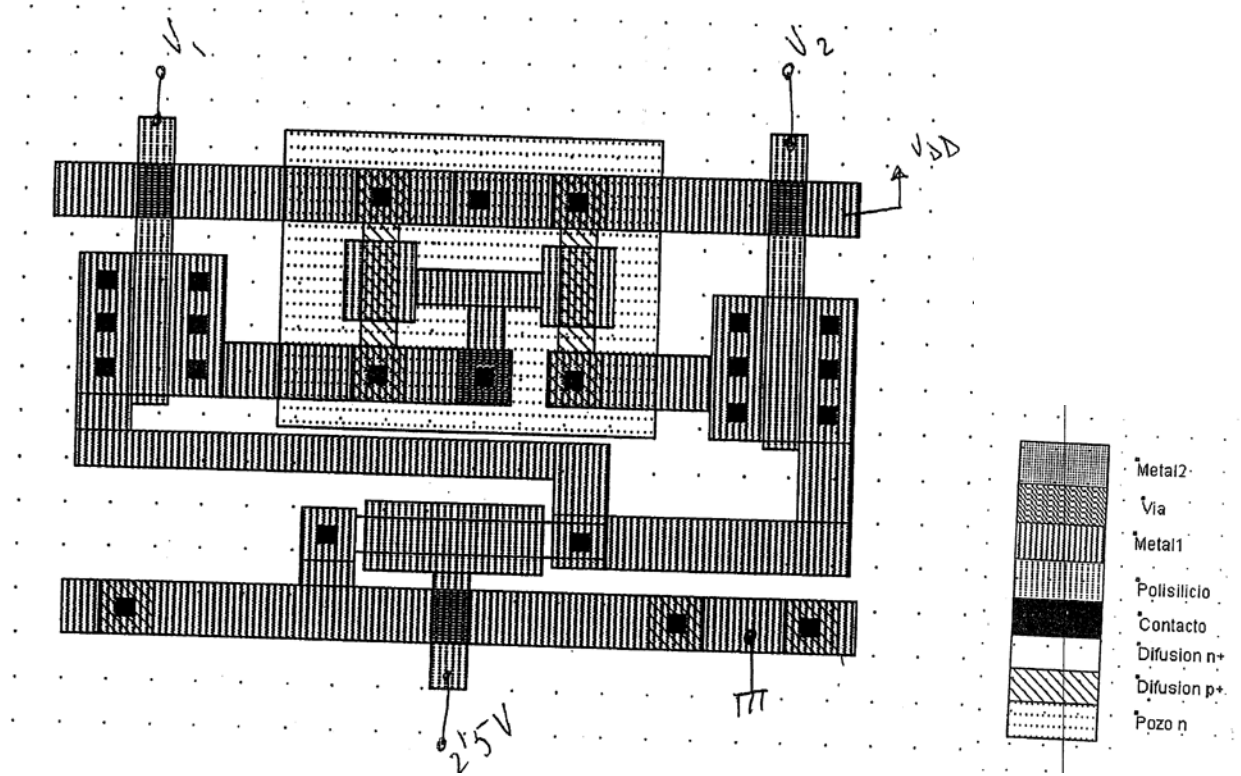 c) Obtain Vo/Vi the amplifier gain

Data:
$k_n = \mu_n C_{ox} = 50 \ \mu A/V^2$
$k_p = \mu_p C_{ox} = 20 \ \mu A/V^2$
$\lambda_n = \lambda_p = 1/30 \ V^{-1}$
$|V_{tn}| = |V_{tp}| = 1V$

Metal2
Via
Metal1
Polisilicio
Contacto
Difusion n+
Difusion p+
Pozo n

Exercise 3

The figure shows the physical scheme of an analog circuit.
 a) Draw the transistor scheme and indicate the aspect ratio W/L for each transistor.
 b) Which is the purpose of so many contacts around the circuit?
 c) Obtain the voltage at A and the current through each transistor
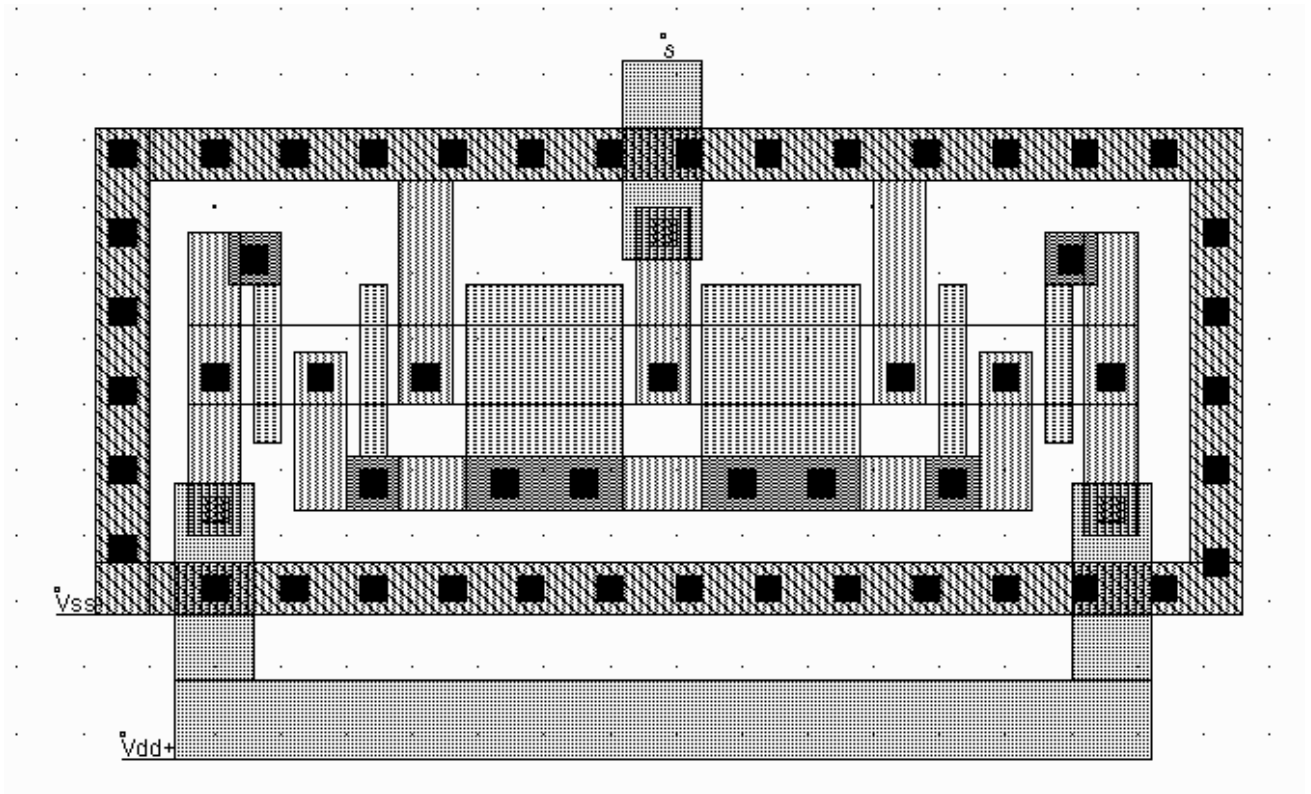
Data:
$k_n = \mu_n C_{ox} = 120 \ \mu A/V^2$
$k_p = \mu_p C_{ox} = 50 \ \mu A/V^2$
$\lambda_n = \lambda_p = 0.1 \ V^{-1}$
$|V_{tn}| = |V_{tp}| = 1V$
Vdd=5V   Vss=0V

S

Vss

Vdd+

	Metal2
	Via
	Metal1
	Contacto
	Poly
	Difusión p+
	Difusión n+
	Pozo n