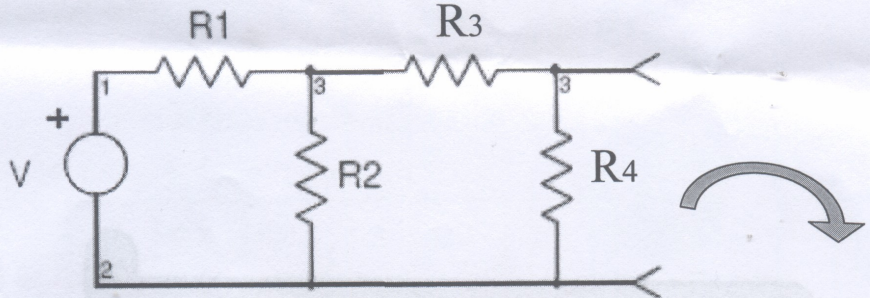


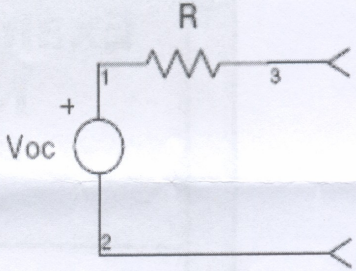
Examen Electronica
Nov.4, 2010
Dr. G. Palasantzas

Opgave 1

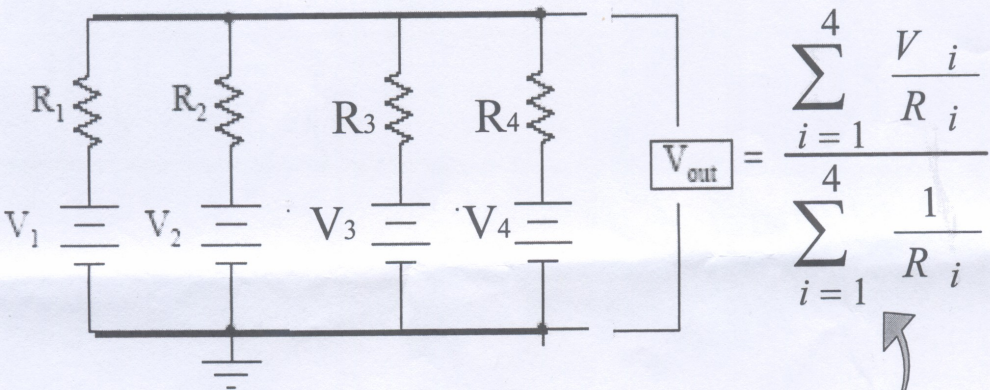
(a) (1 point)



Thevenin: Schrijf V_{oc} en R als functie van V , R_1 , R_2 , R_3 , R_4



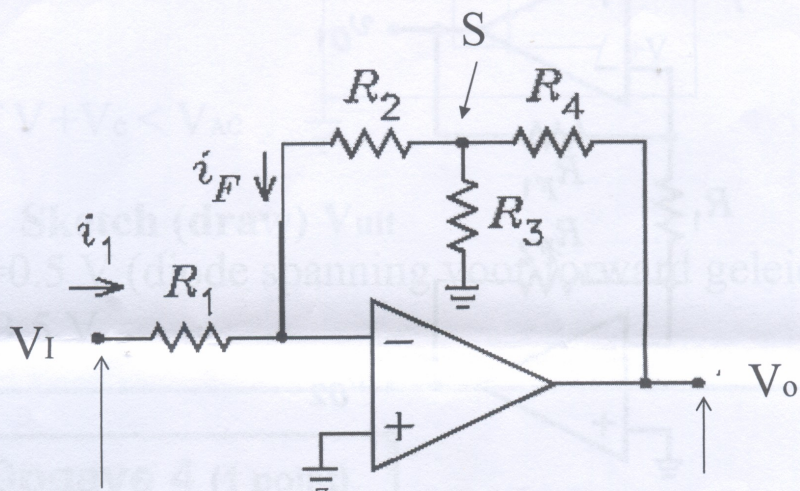
(b) (1 point)



Bewijs (prove) voor V_{out}

Opgave 2 (2 points)

(a) (1 points)

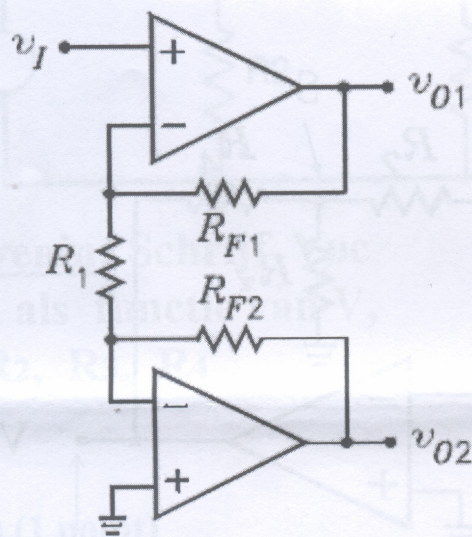


Bewijs (prove):

$$\frac{V_o}{V_I} = - \left[\frac{R_2}{R_1} + \frac{R_4}{R_1} \left(1 + \frac{R_2}{R_3} \right) \right]$$

Tip: ideal opamps $V_+ = V_-$

(b) (1 point)



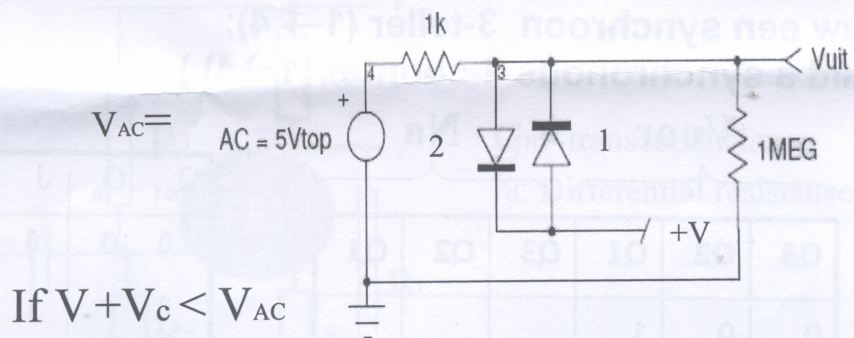
$$v_{O2} = -\frac{R_{F2}}{R_1} v_I$$

Bewijs (prove):

$$v_{O1} = \left(1 + \frac{R_{F1}}{R_1}\right) v_I$$

Tip: ideal opamps $V_+ = V_-$

Opgave 3 (1 point)



Sketch (draw) V_{uit}

$V_c = 0.5 \text{ V}$ (diode spanning voor forward geleiding)

$V = 3.5 \text{ V}$

Opgave 4 (1 point)

K_3		Q_1	
		0	1
Q_3	Q_2	*	*
	0	*	*
	1	0	1
	1	0	0

K_2		Q_1	
		0	1
Q_3	Q_2	*	*
	0	0	1
	1	0	1
	1	*	*

K_1		Q_1	
		0	1
Q_3	Q_2	*	1
	0	*	1
	1	*	0
	1	*	1

Bewijs (prove) (1 points):

[Sketch (draw) grouping]

$$K_3 = Q_2 \cdot Q_1$$

$$K_2 = Q_1$$

$$K_1 = \overline{Q_2} + \overline{Q_3} = \overline{Q_2 \cdot Q_3}$$



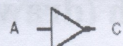
Opgave 5 (2 points)

**Bouw een synchroon 3-teller (1→4):
(Build a synchronous 3-counter (1→4))**

	Voor			Na		
	Q3	Q2	Q1	Q3	Q2	Q1
1	0	0	1			
2	0	1	0			
3	0	1	1			
4	1	0	0			

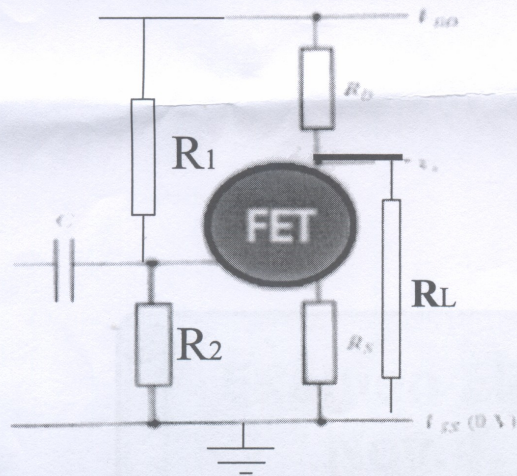
Q _{n-1}	Q _n	J	K
0	0	0	*
0	1	1	*
1	0	*	1
1	1	*	0

***: don't care**

Functie	Symbol	Boolean	Waarheidstabel	J	K	Q _n															
AND		$C = A \cdot B$	<table border="1"> <tr><td>A</td><td>B</td><td>C</td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	A	B	C	0	0	0	0	1	0	1	0	0	1	1	1	0	0	Q _{n-1}
A	B	C																			
0	0	0																			
0	1	0																			
1	0	0																			
1	1	1																			
OR		$C = A + B$	<table border="1"> <tr><td>A</td><td>B</td><td>C</td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	A	B	C	0	0	0	0	1	1	1	0	1	1	1	1	0	1	0
A	B	C																			
0	0	0																			
0	1	1																			
1	0	1																			
1	1	1																			
NOT		$B = \overline{A}$	<table border="1"> <tr><td>A</td><td>B</td></tr> <tr><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td></tr> </table>	A	B	0	1	1	0	1	1	$\overline{Q_{n-1}}$									
A	B																				
0	1																				
1	0																				

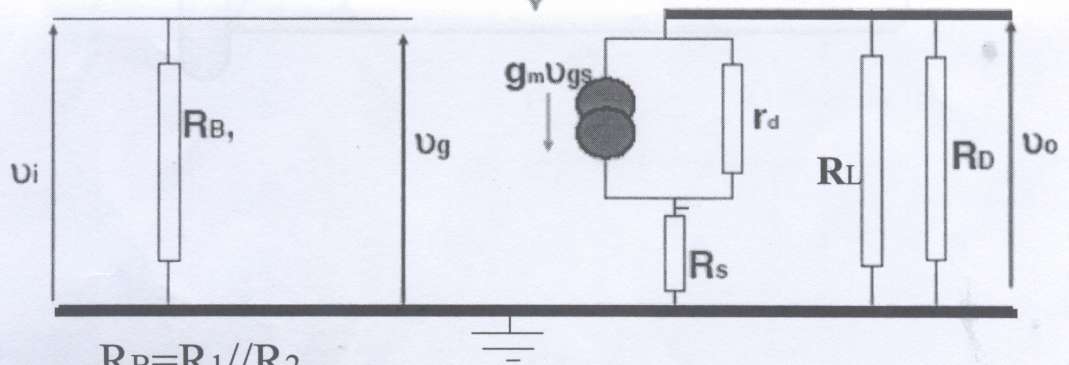
Opgave 6 (2 points)

FET versterker (amplifier):



g_m = transconductance
 r_d : Differential resistance

Small signal circuit



$$R_B = R_1 // R_2$$

Bewijs (prove):

$$v_o / v_i = -g_m (R_{DL}) / [1 + g_m R_s + (R_s + R_{DL}) / r_d]$$

$$R_{DL} = R_D // R_L$$