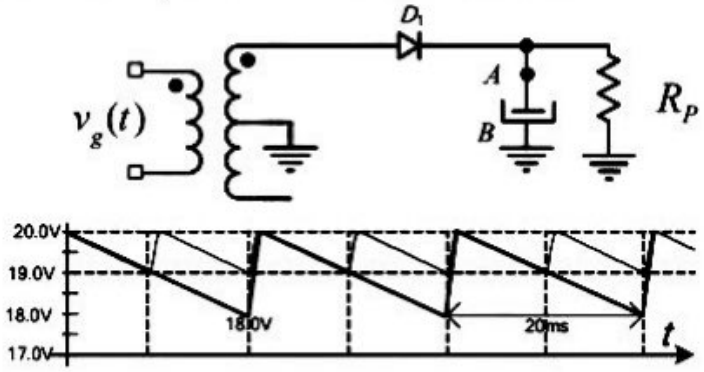
5. U kolu sa slike dat je prostoperiodični generator $v_G(t)$ čija je efektivna vrednost napona 220V.

a) Odrediti prenosni odnos transformatora n:1 tako da je amplituda napona na svakom sekundaru 20V

$$\frac{n}{1} = \frac{220\sqrt{2}}{20} = 11\sqrt{2} \gg 15.6,$$

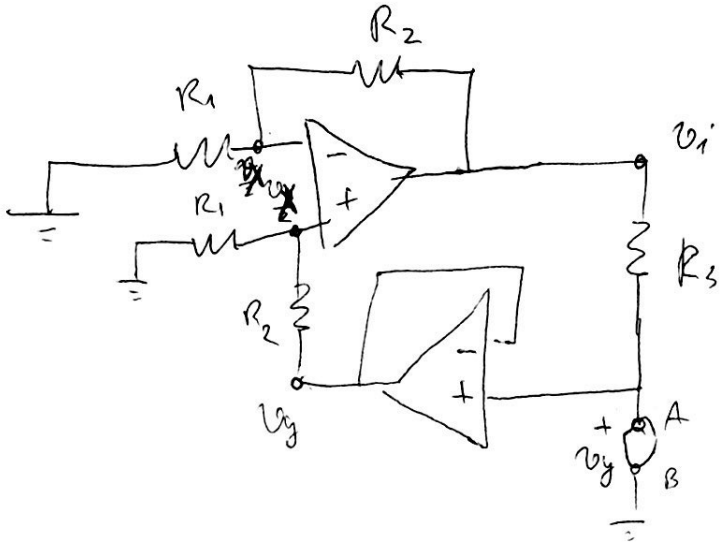
Ako bi primar imao 15.6 navojaka svaki od sekundara bi imao 1 navojak.

b) c) Kada se odgovarajući kondenzator poveže u kolo, dobija se dijagram napona na potrošaču kao na slici. Nacrtati na istom dijagramu kako izgleda napon na potrošaču ukoliko se ukloni jedna od dioda. Precizno obeležiti periodu, minimum i maksimum napona. Smatrati da su diode idealne.



d) [5] Ukoliko bi kapacitivnost kondenzatora težila beskonačnosti, efektivna vrednost naizmenične komponente napona na potrošaču bi bila jednaka nuli, ali bi zato udarna struja bila beskonačna -> pregoreo bi transformator ili bi izbio osigurač.

(2)



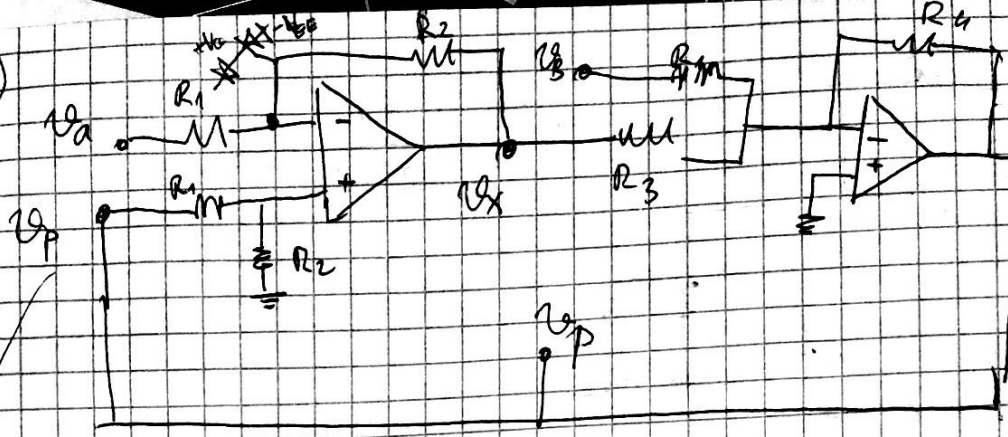
$$v_x = \frac{R_1}{R_1+R_2} v_y$$

$$\frac{v_i - v_x}{R_2} = \frac{v_x}{R_1} \qquad v_i = \left(\frac{R_2}{R_1} + 1\right) v_x = v_y \qquad v_i = v_y$$

$i_y = 0$

$R_{in} = \infty$

(3)



$R_1 = 1k\Omega$
$R_2 = 2k\Omega$
$R_4 = 4k\Omega$
$R_3 = ?$
$k = ?$

$v_p = k(v_x - v_B)$

$$v_p = -\frac{R_4}{R_1} v_B - \frac{R_4}{R_3} v_x$$

$$v_x = \frac{R_2}{R_1}(v_p - v_a)$$

$$v_p = -\frac{R_4}{R_1} v_B - \frac{R_4}{R_3} \cdot \frac{R_2}{R_1}(v_p - v_a)$$

$$v_p + \frac{R_4}{R_3}\cdot\frac{R_2}{R_1} v_p = -\frac{R_4}{R_1} v_B + \frac{R_4 R_2}{R_3 R_1} v_a$$

$$v_p = \frac{-\frac{R_4}{R_1}}{1+\frac{R_4 R_2}{R_3 R_1}} v_B + \frac{\frac{R_4 R_2}{R_3 R_1}}{1+\frac{R_4 R_2}{R_3 R_1}} v_a$$

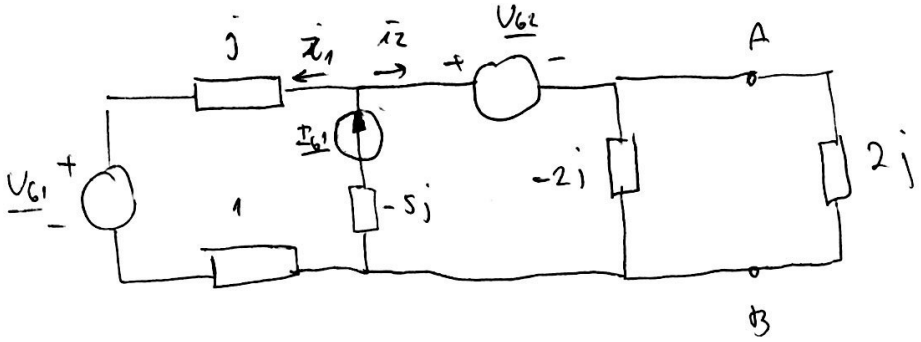
$$\frac{R_4}{R_1} = \frac{R_4 R_2}{R_3 R_1} \quad \boxed{R_3 = R_2} = 2k\Omega$$

$$K = \frac{\frac{R_4}{R_1}}{1+\frac{R_4}{R_1}} = \frac{R_4}{R_1 + R_4} = \frac{4}{5}$$

c) $R_g \ll 1k\Omega$

(4)

$\underline{U_{G1}} = 1+j \quad \underline{U_{G2}} = 2j \quad \underline{I_G} = -j$



$i_1 + i_2 = \underline{I_{G1}}$

$-2j \cdot i_2 + \underline{U_{G2}} - (1+j) i_1 - \underline{U_{G1}} = 0$

$-(1+j) i_1 - 2j i_2 = 1-j \quad / : 1+j$

$-i_1 - \frac{2j}{1+j} i_2 = \frac{1-j}{1+j}$

$i_1 + i_2 = -j$

$-i_1 - (1+j) i_2 = -j$

$-j i_2 = -2j$

$\boxed{i_2 = 2}$

$\frac{2j}{1+j} \cdot \frac{1-j}{1-j} = \frac{2j+2}{2} = 1+j$

$\frac{1-j}{1+j} \cdot \frac{1-j}{1-j} = \frac{(1-2j+1)}{2} = -j$

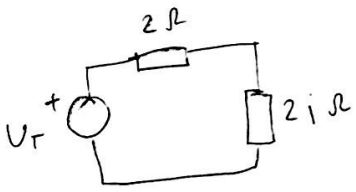
$(1+j) \parallel (-2j) = \frac{(1+j)(-2j)}{1-j} =$

$= \frac{-2j+2}{1-j} = 2$

$1-1-j$

$U_T = -4j$

$Z_T = 2\,\Omega$

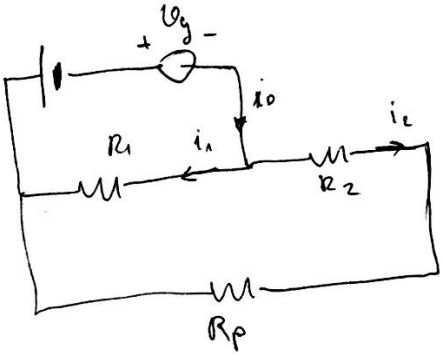


$I = \frac{-2j}{1+j} \cdot \frac{1-j}{1-j} = -j(1-j) = -1-j$

$|I^2| = 2$

$\underline{S} = 4j \quad P = 0W \quad Q = 4VAr$

3. $v_g = -12V$ D_1: ON, D_2: OFF



$i_D = i_1 + i_2$

$i_1 R_1 + v_g + V_D = 0$

$i_1 = -\frac{v_g + V_D}{R_1}$

$i_2 \cdot (R_p + R_2) - i_1 R_1 = 0$

$i_2 (R_p + R_2) = -v_g - V_D$

$i_2 = -\frac{v_g + V_D}{R_p + R_2} = -\frac{v_g + V_D}{4R}$

$i_1 + i_2 = -\frac{5v_g + 5V_D}{R} = i_D$

3. $v_g = -5V_D$ D_1 ↗ OFF

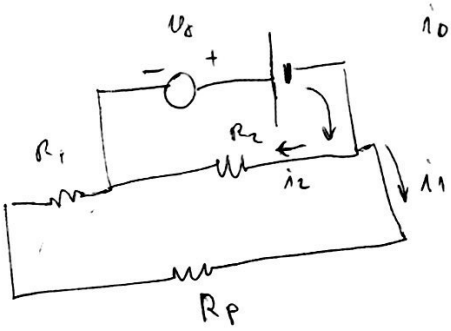
$v_g \in (-12, -0,7)$

$$v_p = -\frac{3}{4}v_g - 0,525 \quad | 1^0$$

$v_{D2} = \frac{1}{4}v_g - 0,525$ combinație ↓ OFF

3. $v_g = 4,9V$ D_2 → ON

$v_p = 0V$ | 2^0 $v_g \in (-0,7, 0,7)$



$i_D = i_1 + i_2$

$i_2 R_2 + V_D - v_g = 0$

$i_2 = \frac{v_g - V_D}{R_2}$

$i_1 (R_1 + R_p) = v_g - V_D$

$i_1 = \frac{v_g - V_D}{R_1 + R_p}$

$i_D = \frac{5v_g - 5V_D}{R}$ ↗ combinație ON

$v_g = \frac{3}{4}v_g - 0,525$ | 3^0 $v_g \in (0,7, 12)$

$v_{D2} = +i_1 R_1 - v_g = -v_g + \frac{1}{4}v_g - \frac{1}{4}V_D = -\frac{3}{4}v_g - \frac{1}{4}V_D < 0$