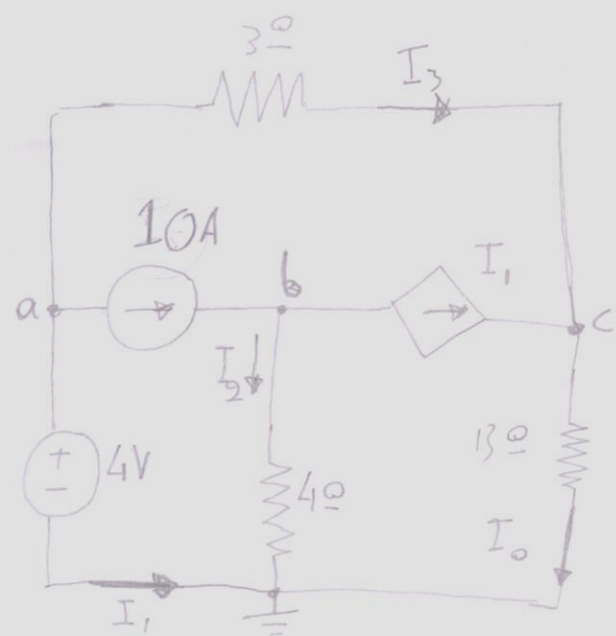$$R_1 = 2+W = 2+1 = 3\,\Omega$$
$$R_2 = 4+Z = 4\,\Omega$$
$$R_3 = 5+Y = 5+8 = 17\,\Omega$$
$$V_s = 12 - Y = 12 - 8 = 4V$$
$$I_s = 10 - Z = 10A$$
$$k = W = 1$$

Έχουμε ότι $V_\alpha = 4V$

κόμβος b: $\quad 10 = I_1 + \dfrac{V_B}{4}$ (b)

κόμβος c: $\quad \dfrac{V_\alpha - V_c}{3} + I_1 = \dfrac{V_c}{13}$ (c)

(b) $\Rightarrow$ $40 = 4I_1 + V_B \Rightarrow V_B = 40 - 4I_1$

(c) $\Rightarrow$ $12 - 3V_c + 3I_1 = 3\dfrac{V_c}{13} \rightarrow 156 - 39V_c + 39I_1 = 3V_c \Rightarrow$

$52 - 13V_c + 13I_1 = V_c \Rightarrow 14V_c = 13I_1 + 52$

Βρόχος: $\quad I_1 + I_3 + 10 = 0 \Rightarrow I_1 + 10 + \dfrac{V_\alpha - V_c}{3} = 0 \Rightarrow$

$3I_1 + 30 + V_\alpha - V_c = 0 \Rightarrow 3I_1 + 34 = V_c.$ (d) Άρα

Αντικαθιστώ στην (c) τι (d):

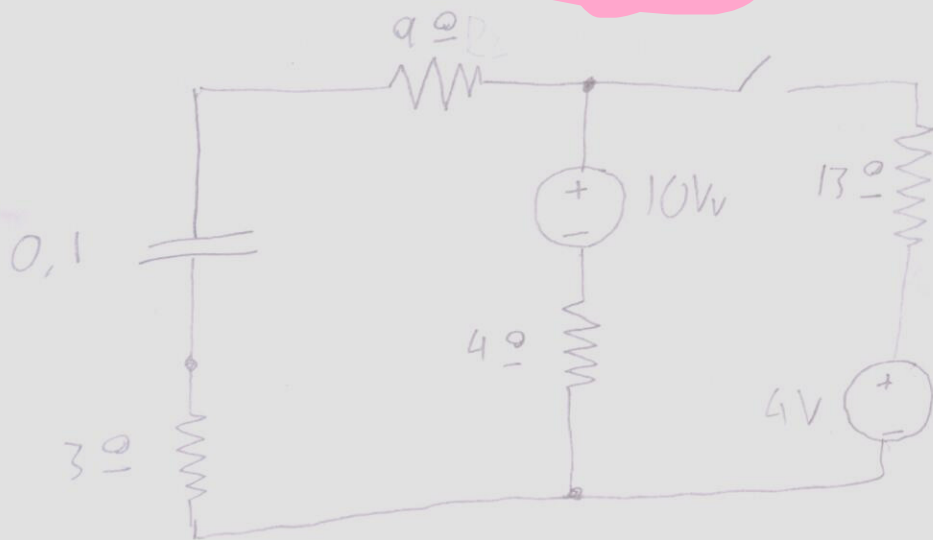(c) $\xrightarrow{(d)}$ $V_c = -390V$ και $I_1 = -424A$

άρα $\boxed{I_0 = \dfrac{V_c}{17} = \dfrac{-424}{13} = -36.61A}$

kar
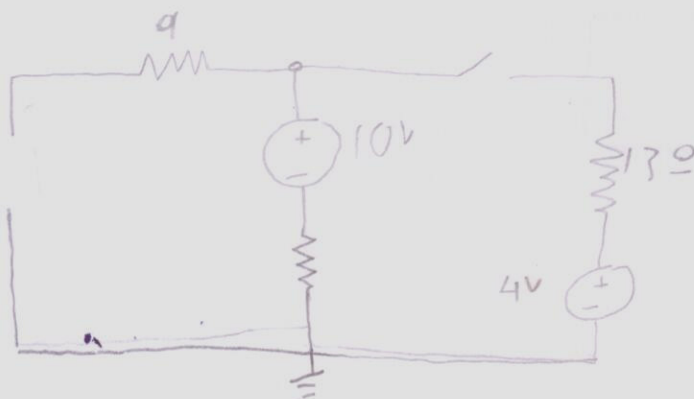
$$P = VI = (V_b - V_c) \cdot I_1 = (1724 + 590) \cdot (-.424) =$$

$$\boxed{-8.96 \ Watt}$$

kar

$$P = VI = (V_b - V_c) \cdot I_1 = (1724 + 590) \cdot (-.424) =$$

$$-8.96 \ Watt$$

$R_1 = 2+W = 3\ \Omega$

$R_2 = 4+z = 4\ \Omega$

$R_3 = 5+y = 13\ \Omega$

$R_4 = 1+y = 9\ \Omega$

$V_{S1} = 12-y = 4\ V$

$V_{S2} = 10-z = 10\ V$

$C = 0.1\ F$

(α) Τα $t<0$ έχουμε: πυκνωτη → ανοιχτοκύκλωμα



Παρατηρούμε ότι η τάση $V_C(0^-)$ είναι ίση με $V_{S2}$. Άρα η αρχική συνθήκη είναι
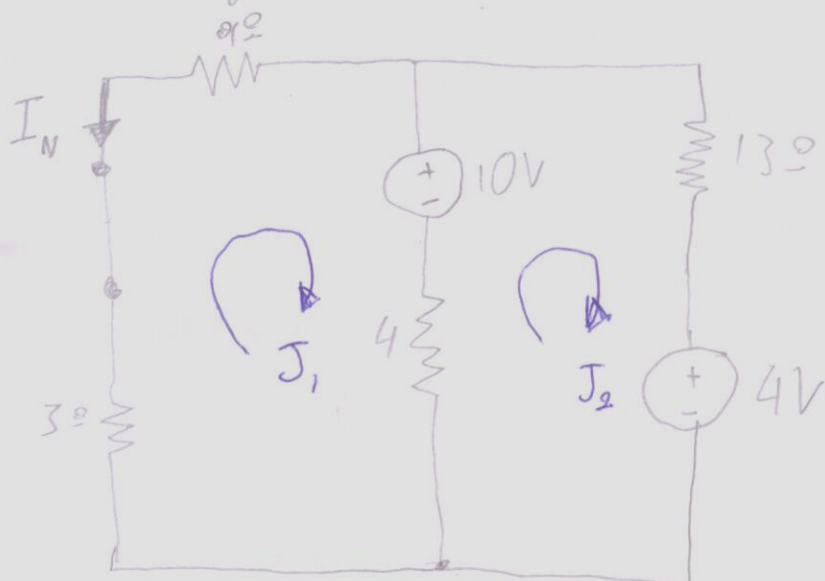
$$\boxed{V_C(0^-) = V_{S2} = 10\ V}$$

(β)



$(13//4) = \dfrac{13\cdot 4}{13+4} = \dfrac{57}{12}$

και

$R_3) = 3 + \dfrac{57}{12} + 9 = 16.75\ \Omega$

Άρα $\boxed{R_T = R_d = 16.75\ \Omega}$

Υπολογίζω $I_N$



Βρόχος Α: $9J_1 + 4(J_1 - J_2) + 3J_1 = -10$
Βρόχος Β: $4(J_2 - J_1) + 13J_2 = -4 + 10$

$\Rightarrow J_1 = -\dfrac{73}{128}$ A, $J_2 = \dfrac{7}{32}$ A

Έχουμε ότι $\boxed{I_N = -J_1 = \dfrac{73}{128}}$

Άρα $\boxed{V_{TH} = I_N \cdot R_{TH} = \dfrac{73}{128} \cdot 16,75 = \dfrac{4891}{512} = 9,55 \text{V}}$
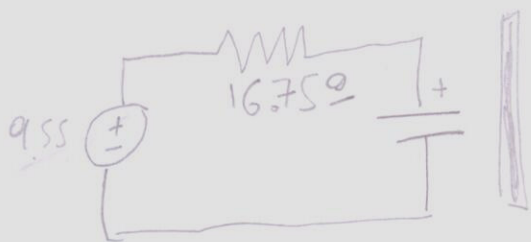
Το ισοδύναμο thevenin είναι

γ)
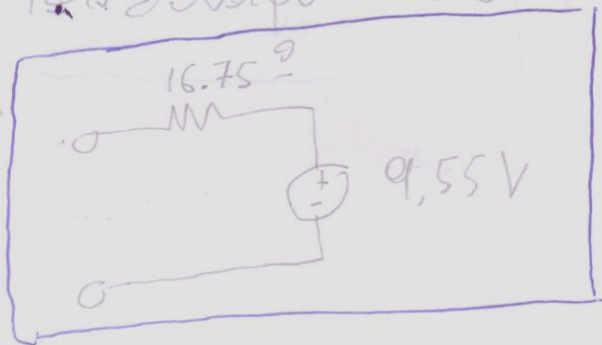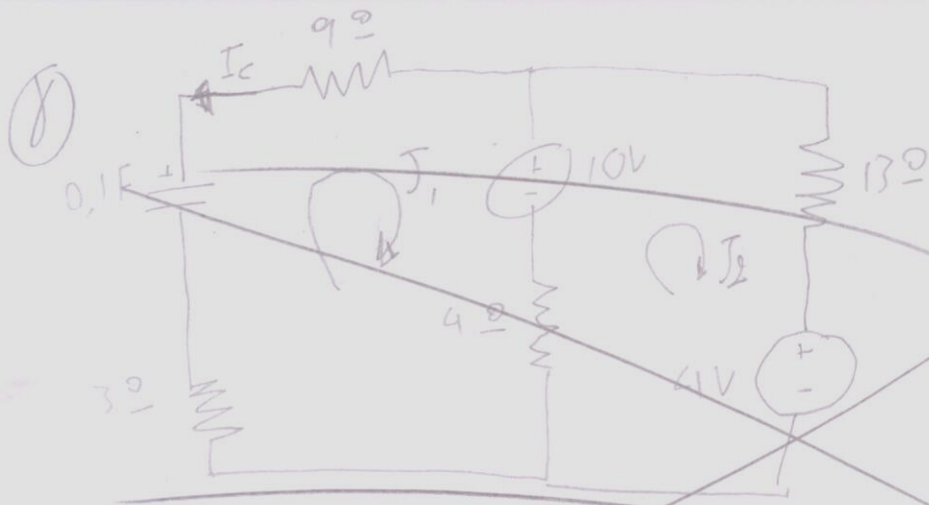


Για $V_C(0^+) = V_C(0^-) = 10V$. Η εξίσωση του βρόχου του πυκνωτή είναι:

$$V_C(t) + 9 \cdot J_1 - 4(J_1 - J_2) + 5J_1 = 10V \Rightarrow$$

Από το thevenin εξαρτά: του ΕQωπίτος G
ο βρόχος:

$$V_C(t) + i_C \cdot 16,75 = 9,55 \Rightarrow$$

$$V_C(t) + \frac{1}{10}\frac{dV_C}{dt} \cdot 16,75 = 9,55 \Rightarrow$$

$$\boxed{V_C(t) = 9,55\left[1 - e^{\frac{-t}{1,675}}\right]}$$