Sujet BTS MAI 1999 — 01-06-99 — [redacted] — 1/2

A] Chaine de mesure

I - T° (4/5)

1 ① $V_{S_1} = at + b$

$5 = 150a + b$ → $50a = 5 \rightarrow a = 0,1$

$0 = 100a + b$ $\quad 0 = 100 \times 0,1 + b \rightarrow b = -10$

(1) → $\boxed{V_{S_1} = 0,1t - 10}$ ①

3 ② a) $\boxed{i_1 = \frac{V_0}{R_1}}$ (0,25) car $v_d = 0$. $\boxed{i_2 = \frac{V_{S1}}{R_2}}$ (0,25)

b) $i = i_1 + i_2$ car $i^- = 0$.

$a(t+273) = \frac{V_0}{R_1} + \frac{V_{S1}}{R_2}$ ⟹ (1) $\boxed{V_{S_1} = R_2 a(t+273) - \frac{R_2}{R_1} V_0}$ ②

$V_{S_1} = 0,1t - 10$.

c) R_2 ? $R_1 = 10k\Omega$

$0,1 = R_2 a \rightarrow R_2 = \frac{0,1}{a} = \frac{0,1}{10^{-6}} = 10^5 \Omega$

(0,75) $\boxed{R_2 = 100k\Omega}$. ① et ② ⟹ $-10 = R_2 a \times 273 - \frac{R_2}{R_1} V_0$.

$-10 = 10^5 \times 10^{-6} \times 273 - 10 V_0$.

$-10 = 27,3 - 10 V_0$.

→ $\boxed{V_0} = \frac{27,3 + 10}{10} = \boxed{3,73 V}$ (0,75)

II Pression 8/13.

1 ① $V_{S_2} = ap + b$ $\quad 5 = 4 \times 10^5 a + b$ → $5 = 2 10^5 a \Rightarrow a = \frac{5}{2 \times 10^5}$

$0 = 2 \times 10^5 a + b$ $\quad a = 2,5 \times 10^{-5}$

(1) $\boxed{V_{S_2} = 2,5 \times 10^{-5} p - 5}$. $\quad 0 = 2 \times 10^5 \times 2,5 \times 10^{-5} + b \rightarrow b = -5$

5 ② $\frac{\Delta R}{R_0} = kp$; $k = 2,5 \times 10^{-8} Pa^{-1}$

3 a) diviseur de tension $\boxed{V_1 = \frac{R_0 + \Delta R}{2R_0} E}$ (1) $\boxed{V_2 = \frac{R_0 - \Delta R}{2R_0} E}$ (1)

→ $\boxed{V_1 - V_2} = \frac{\Delta R}{R_0} E = \boxed{kpE}$ (0,5)

AN. $V_1 - V_2 = 2,5 \times 10^{-8} \times 4 \times 10^5 \times 10 = \boxed{0,1 V}$ (0,5)

2 b) $V_{S_2} = 2,5 \times 10^{-5} p - 5$ avec $p = \frac{V_1 - V_2}{kE} = \frac{V_1 - V_2}{2,5 \times 10^{-8} \times 10} = \frac{10^8 (V_1 - V_2)}{25} = 4 \times 10^6 (V_1 - V_2)$

$\boxed{V_S = 10^2 (V_1 - V_2) - 5}$

2 ③ $\boxed{V_{S_2} = -[A(V_2 - V_1) + V_r]}$ = avec $V_1 - V_2 = kpE$

$V_{S_2} = 10^2(V_1 - V_2) - 5$ (question 2b) $\rightarrow$ (1) $\boxed{V_{S_2} = A k p E - V_r}$

A.N. $E = 10V \rightarrow \boxed{V_r = +5V \quad A = +10^2}$ (1)

B] CHAÎNE DE COMMANDE

4 III] Moteur 4 pts

$E' = k n \Phi$

1 ① $I_e = cte \rightarrow \Phi = cte \rightarrow E' = kn$ $\quad E'_N = U_N - RI_N = 170 - 4{,}2 \times 2{,}6$

$k = \frac{E'}{n}$ $\quad E'_N = 170 - 10{,}92 \simeq 159V$ (159,08)

et $n_N = 50 tr/s \rightarrow \boxed{k = 3{,}18 V s tr^{-1}}$

1 ② $C_e = \frac{EI}{2\pi n} = \boxed{\frac{kI}{2\pi}}$

1 ③ $C_{eN} = \frac{kI_N}{2\pi} = 3{,}18 \times \frac{2{,}6}{2\pi} = \boxed{1{,}317 Nm}$ (1,31655)

1 $C_{uN} = \frac{P_{uN}}{2\pi n_N} = \frac{368}{2\pi \times 50} = \boxed{1{,}171 Nm}$ (1,17138)

IV] Variateur et sa commande (4 pts)

(4,5) $u_c = 10V \rightarrow \theta = 180°$ $\quad \theta = k' u_c$ $\quad U = 220V$ 50Hz

① a) $\boxed{v = E' + Ri + L\frac{di}{dt}}$ (1) b) $\boxed{V_{moy} = E' + RI_{moy} + 0}$ (0,5)

1 c) $V_{moy} = kn + RI_{moy} \rightarrow \boxed{n = \frac{V_{moy} - RI_{moy}}{k}}$

0,5 ② AN $n = \frac{100 - 4{,}2 \times 2{,}6}{3{,}18} = \boxed{28 tr/s}$

③ $u_c = k'' N_D$. $\quad N_D = 255 \rightarrow u_{cmax} = 9{,}96V. \Rightarrow k'' = \frac{9{,}96}{255}$

0,5 a) $(S) = 00111111 = \boxed{63}$

128 64 32 16 8 4 2 1

0,5 b) $u_c = k'' \times N_D = \frac{9{,}96}{255} \times 63 = \boxed{2{,}46V}$

et $\theta = k' u_c$ avec $\theta = 180°$ pour $u_c = 10V \rightarrow k' = \frac{180}{10} = 18° V^{-1}$

0,5 $\theta = 18 \times 2{,}46 = \boxed{44{,}3°}$