

rechnung_umkehrintegrator

Student Group

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Table of Contents

$U_A = f(U_E)$
with III.
$U_A = \frac{1}{A_D} \cdot U_E$
with II. and I.: $\frac{1}{A_D} \cdot U_E = \frac{1}{C} \cdot \int_{t_0}^{t_1} I_C \, dt + Q_0(t_0)$
$U_A = \frac{1}{C} \cdot \int_{t_0}^{t_1} I_C \, dt + Q_0(t_0)$
with IV.: $I_C = I_R$
$U_A = \frac{1}{C} \cdot \int_{t_0}^{t_1} I_R \, dt + Q_0(t_0)$
Factor out
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} I_R \, dt - \frac{Q_0(t_0)}{C}$
consider the integration constant: $\frac{Q_0(t_0)}{C} = U_C(t_0) = -U_{A0}$
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} I_R \, dt + U_{A0}$
with VI. and II.: $I_R = \frac{U_R}{R} = \frac{U_E}{R}$
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} \frac{U_E}{R} \, dt + U_{A0}$
move constant ahead
$U_A = -\frac{1}{R \cdot C} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$
insert time constant $\tau = R \cdot C$
$U_A = -\frac{1}{\tau} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$

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