

rechnung_umkehrintegrator

Student Group

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