FORMULE KOJE JE DOZVOLJENO IMATI NA KOLOKVIJU I PISMENOM ISPITU IZ KOLEGIJA "SIGNALI I SUSTAVI", Studij Računarstvo. 120

Eulerove relacije:

$$Ae^{j\omega_0 t} = A\cos(\omega_0 t) + j\,A\sin(\omega_0 t)$$

$$Ae^{-j\omega_0 t} = A\cos(\omega_0 t) - j\,A\sin(\omega_0 t)$$

$$\cos(\omega_0 t) = \frac{e^{j\omega_0 t} + e^{-j\omega_0 t}}{2}$$

$$\sin(\omega_0 t) = \frac{e^{j\omega_0 t} - e^{-j\omega_0 t}}{2j}$$

$$\int \ln x\, dx = x\ln x - x + C$$

$$\int \log_b x\, dx = x\log_b x - x\log_b e + C$$

$$\int e^x\, \mathrm{d}x = e^x + C$$

$$\int a^x\, \mathrm{d}x = \frac{a^x}{\ln a} + C$$

$$\int \frac{\mathrm{d}x}{\sqrt{a^2 - x^2}} = \arcsin\frac{x}{a} + C$$

$$\int \frac{\mathrm{d}x}{a^2 + x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$$

$$\int \frac{\mathrm{d}x}{a^2 - x^2} = \frac{1}{a}\operatorname{arth}\frac{x}{a} + C = \frac{1}{2a}\ln\left|\frac{a+x}{a-x}\right| + C$$

$$\int \frac{\mathrm{d}x}{x^2 - a^2} = -\frac{1}{a}\operatorname{arcth}\frac{x}{a} + C = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right| + C$$

Osnovne trigonometrijske relacije:

$\sin(x \pm y) = \sin(x)\cos(y) \pm \cos(x)\sin(y)$

$\cos(x \pm y) = \cos(x)\cos(y) \mp \sin(x)\sin(y)$

$\sin(x)\sin(y) = 0.5(\cos(x - y) - \cos(x + y))$

$\cos(x)\cos(y) = 0.5(\cos(x - y) + \cos(x + y))$

$\sin(x)\cos(y) = 0.5(\sin(x - y) + \sin(x + y))$

$\sin(2x) = 2\sin(x)\cos(x)$

$\cos(2x) = \cos^2(x) - \sin^2(x)$

$2\sin^2(x) = 1 - \cos(2x)$

$2\cos^2(x) = 1 + \cos(2x)$

Sume:

$$\sum_{k=0}^{\infty} \alpha^k = \frac{1}{1-\alpha}, \text{ ako je } 0 < |\alpha| < 1$$

$$\sum_{k=0}^{n} \alpha^k = \frac{1-\alpha^{n+1}}{1-\alpha}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\int x^n\, \mathrm{d}x = \frac{x^{n+1}}{n+1} + C,\ n \neq -1$$

$$\int \frac{\mathrm{d}x}{x} = \ln|x| + C$$

$$\int \sin x\, \mathrm{d}x = -\cos x + C$$

$$\int \cos x\, \mathrm{d}x = \sin x + C$$

$$\int \frac{\mathrm{d}x}{\sin^2 x} = -\operatorname{ctg} x + C$$

$$\int \frac{\mathrm{d}x}{\cos^2 x} = \operatorname{tg} x + C$$

$$\int \operatorname{sh} x\, \mathrm{d}x = \operatorname{ch} x + C$$

Laplace-ova transformacija:

$$L\{x(t)\} = X(s) = \int_{-\infty}^{\infty} x(t)e^{-st}dt,$$

$s = \sigma + j\omega$

za $x(t) = 0$ pri $t < 0$:

$$L\{x(t)\} = X(s) = \int_{0}^{\infty} x(t)e^{-st}dt$$

Tablica Laplace-ovih transformacija osnovnih funkcija:

x(t), pri čemu je x(t) = 0 za t < 0	**X(s)**		**x(t), pri čemu je x(t) = 0 za t < 0**	**X(s)**		**x(t), pri čemu je x(t) = 0 za t < 0**	**X(s)**
$\delta(t)$	1		$\sin(\omega t)$	$\frac{\omega}{s^2+\omega^2}$		$e^{\pm at}\sin(\omega t)$	$\frac{\omega}{(s\mp a)^2+\omega^2}$
$u(t)$	$1/s$		$\cos(\omega t)$	$\frac{s}{s^2+\omega^2}$		$e^{\pm at}\cos(\omega t)$	$\frac{s\mp a}{(s\mp a)^2+\omega^2}$
t	$1/s^2$		$e^{\pm at}$	$\frac{1}{s\mp a}$		$te^{\pm at}$	$\frac{1}{(s\mp a)^2}$
t^2	$2/s^3$		t^n	$n! / s^{n+1}$			

LT pomaknutog signala:

$$L\{x(t \pm a)u(t \pm a)\} = e^{\pm as}X(s)$$

$$L\{e^{\pm as}x(t)u(t)\} = X(s \mp a)$$

LT derivacije signala:

$$L\left\{\frac{d^n x(t)}{dt^n}\right\} = s^n X(s) - s^{n-1}x(0) - s^{n-2}\dot{x}(0) - s^{n-3}\ddot{x}(0) - \ldots$$

LT integrala signala:

$$L\{\, n - \text{tog integrala od } x(t)\} = \frac{1}{s^n}X(s)$$

Formula za određivanje residuuma višestrukih polova prijenosne funkcije:

$$W(s) = \frac{Br(s)}{(s-p_1)^m (s-p_2)\ldots(s-p_n)} = \frac{K_1}{(s-p_1)^m} + \frac{K_2}{(s-p_1)^{m-1}} + \frac{K_3}{(s-p_1)^{m-2}} + \ldots + \frac{K_m}{s-p_1} + \frac{K_{m+1}}{s-p_2} + \ldots + \frac{K_{m+n-1}}{s-p_n}$$

$K_1 \ldots K_i \ldots K_m$: residuumi m-strukog pola računaju se prema formuli: $K_i = \frac{1}{(i-1)!}\frac{d^{i-1}}{ds^{i-1}}\left[(s-p_1)^m W(s)\right]\Big|_{s=p1}$