

APPENDIX PRELIMINARIES

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C-0. APPENDIX PRELIMINARIES

Laplace Transform $F(s)$	Time Function $f(t)$
1	Unit-impulse function $\delta(t)$
$\frac{1}{s}$	Unit-step function $u_s(t)$
$\frac{1}{s^2}$	Unit-ramp function t
$\frac{n!}{s^{n+1}}$	t^n ($n = \text{positive integer}$)
$\frac{1}{s + \alpha}$	$e^{-\alpha t}$
$\frac{1}{(s + \alpha)^2}$	$te^{-\alpha t}$
$\frac{n!}{(s + \alpha)^{n+1}}$	$t^n e^{-\alpha t}$ ($n = \text{positive integer}$)
$\frac{1}{(s + \alpha)(s + \beta)}$	$\frac{1}{\beta - \alpha} (e^{-\alpha t} - e^{-\beta t})$ ($\alpha \neq \beta$)
$\frac{s}{(s + \alpha)(s + \beta)}$	$\frac{1}{\beta - \alpha} (\beta e^{-\beta t} - \alpha e^{-\alpha t})$ ($\alpha \neq \beta$)
$\frac{1}{s(s + \alpha)}$	$\frac{1}{\alpha} (1 - e^{-\alpha t})$
$\frac{1}{s(s + \alpha)^2}$	$\frac{1}{\alpha^2} (1 - e^{-\alpha t} - \alpha t e^{-\alpha t})$
$\frac{1}{s^2(s + \alpha)}$	$\frac{1}{\alpha^2} (\alpha t - 1 + e^{-\alpha t})$
$\frac{1}{s^2(s + \alpha)^2}$	$\frac{1}{\alpha^2} \left[t - \frac{2}{\alpha} + \left(t + \frac{2}{\alpha} \right) e^{-\alpha t} \right]$
$\frac{s}{(s + \alpha)^2}$	$(1 - \alpha t) e^{-\alpha t}$

Laplace Transform $F(s)$

Time Function $f(t)$

$\frac{\omega_n}{s^2 + \omega_n^2}$	$\sin \omega_n t$
$\frac{s}{s^2 + \omega_n^2}$	$\cos \omega_n t$
$\frac{\omega_n^2}{s(s^2 + \omega_n^2)}$	$1 - \cos \omega_n t$
$\frac{\omega_n^2(s + \alpha)}{s^2 + \omega_n^2}$	$\omega_n \sqrt{\alpha^2 + \omega_n^2} \sin(\omega_n t + \theta)$ where $\theta = \tan^{-1}(\omega_n/\alpha)$
$\frac{\omega_n}{(s + \alpha)(s^2 + \omega_n^2)}$	$\frac{\omega_n}{\alpha^2 + \omega_n^2} e^{-\alpha t} + \frac{1}{\sqrt{\alpha^2 + \omega_n^2}} \sin(\omega_n t - \theta)$ where $\theta = \tan^{-1}(\omega_n/\alpha)$
$\frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$	$\frac{\omega_n}{\sqrt{1 - \zeta^2}} e^{-\zeta\omega_n t} \sin \omega_n \sqrt{1 - \zeta^2} t (\zeta < 1)$
$\frac{\omega_n^2}{s(s^2 + 2\zeta\omega_n s + \omega_n^2)}$	$1 - \frac{1}{\sqrt{1 - \zeta^2}} e^{-\zeta\omega_n t} \sin(\omega_n \sqrt{1 - \zeta^2} t + \theta)$ where $\theta = \cos^{-1} \zeta (\zeta < 1)$
$\frac{s\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$	$\frac{-\omega_n^2}{\sqrt{1 - \zeta^2}} e^{-\zeta\omega_n t} \sin(\omega_n \sqrt{1 - \zeta^2} t - \theta)$ where $\theta = \cos^{-1} \zeta (\zeta < 1)$
$\frac{\omega_n^2(s + \alpha)}{s^2 + 2\zeta\omega_n s + \omega_n^2}$	$\omega_n \sqrt{\frac{\alpha^2 - 2\alpha\zeta\omega_n + \omega_n^2}{1 - \zeta^2}} e^{-\zeta\omega_n t} \sin(\omega_n \sqrt{1 - \zeta^2} t + \theta)$ where $\theta = \tan^{-1} \frac{\omega_n \sqrt{1 - \zeta^2}}{\alpha - \zeta\omega_n} (\zeta < 1)$
$\frac{\omega_n^2}{s^2(s^2 + 2\zeta\omega_n s + \omega_n^2)}$	$t - \frac{2\zeta}{\omega_n} + \frac{1}{\omega_n \sqrt{1 - \zeta^2}} e^{-\zeta\omega_n t} \sin(\omega_n \sqrt{1 - \zeta^2} t + \theta)$ where $\theta = \cos^{-1}(2\zeta^2 - 1) (\zeta < 1)$

Citation

EXPORT

Dr. Farid Golnaraghi; Dr. Benjamin C. Kuo: Automatic Control Systems, Tenth Edition. APPENDIX PRELIMINARIES, Chapter (McGraw-Hill Professional, 2017), AccessEngineering



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