

**A – TABELA DAS PROPRIEDADES DA TRANSFORMADA DE LAPLACE**

|    |   |  |
|----|---|--|
|    | $f(t)$  | $F(s) = \int_0^{\infty} e^{-st} f(t) dt$   |
| 1  | $a f(t) + b g(t)$   | $a F(s) + b G(s)$  |
| 2  | $e^{at} f(t)$   | $F(s - a)$   |
| 3  | $f(t - a) H(t - a)$ , com $a \geq 0$  | $e^{-as} F(s)$   |
| 4  | $f'(t)$   | $sF(s) - f(0)$   |
| 5  | $f''(t)$  | $s^2 F(s) - sf(0) - f'(0)$   |
|    | $f^{(n)}(t)$  | $s^n F(s) - s^{n-1} f(0) - \dots - f^{(n-1)}(0)$   |
| 6  | $\int_0^t f(u) du$  | $\frac{F(s)}{s}$   |
| 7  | $t^n f(t)$  | $(-1)^n \frac{d^n F}{ds^n}(s)$   |
| 8  | $f(t) = f(t + T), \forall t = 0$  | $\frac{\int_0^T e^{-st} f(t) dt}{1 - e^{-sT}}$   |
| 9  | $\int_0^t f(u) g(t - u) du$   | $F(s) \cdot G(s)$  |
| 10 | $e^{s_n t} \sum_{k=1}^m \frac{A_k t^{m-k}}{(m-k)!}, \text{ onde:}$ $A_k = \lim_{s \rightarrow s_n} \frac{1}{(k-1)!} \frac{d^{k-1}}{ds^{k-1}} \left\{ (s - s_n)^m F(s) \right\}$ | $\frac{P(s)}{Q(s)}$ , com $P(s)$ e $Q(s)$ polinômios,<br>grau $(P(s)) <$ grau $(Q(s))$ .<br>$s_n$ raiz de $Q(s)$ de multiplicidade $m$ . |

**B – TABELA DE TRANSFORMADAS DE LAPLACE IMPORTANTES**

|   | $f(t)$            | $F(s)$                |    | $f(t)$                       | $F(s)$                |
|---|-------------------|-----------------------|----|------------------------------|-----------------------|
| 1 | 1                 | $\frac{1}{s}$         | 6  | $\cos at$                    | $\frac{s}{s^2 + a^2}$ |
| 2 | t                 | $\frac{1}{s^2}$       | 7  | $\sinh at$                   | $\frac{a}{s^2 - a^2}$ |
| 3 | $t^n$ , n natural | $\frac{n!}{s^{n+1}}$  | 8  | $\cosh at$                   | $\frac{s}{s^2 - a^2}$ |
| 4 | $e^{at}$          | $\frac{1}{s - a}$     | 9  | $H(t - a)$ , $a \geq 0$      | $\frac{e^{-as}}{s}$   |
| 5 | $\sin at$         | $\frac{a}{s^2 + a^2}$ | 10 | $\delta(t - a)$ , $a \geq 0$ | $e^{-as}$             |

**NÚMEROS COMPLEXOS**

$$z = x + iy \Leftrightarrow e^z = e^x (\cos y + i \sin y)$$

$$\sinh z = \frac{e^z - e^{-z}}{2}, \quad \cosh z = \frac{e^z + e^{-z}}{2}, \quad \sin z = \frac{e^{iz} - e^{-iz}}{2i}, \quad \cos z = \frac{e^{iz} + e^{-iz}}{2}$$