

**TABLE B.1** PARTIAL LIST OF FUNCTIONS AND THEIR LAPLACE TRANSFORMS WITH ZERO INITIAL CONDITIONS AND  $t > 0$

$F(s)$	$f(t)$
(1) 1	$\delta(t_0)$ unit impulse at $t_0$
(2) $\frac{1}{s}$	1, unit step
(3) $\frac{1}{s+a} \left( \frac{1}{s-a} \right)$	$e^{-at}$ ( $e^{at}$ )
(4) $\frac{1}{(s+a)(s+b)}$	$\frac{1}{b-a} (e^{-at} - e^{-bt})$
(5) $\frac{\omega}{s^2 + \omega^2}$	$\sin \omega t$
(6) $\frac{s}{s^2 + \omega^2}$	$\cos \omega t$
(7) $\frac{1}{s(s^2 + \omega^2)}$	$\frac{1}{\omega^2} (1 - \cos \omega t)$
(8) $\frac{1}{s^2 + 2\zeta\omega s + \omega^2}$	$\frac{1}{\omega_d} e^{-\zeta\omega t} \sin \omega_d t, \zeta < 1, \omega_d = \omega\sqrt{1 - \zeta^2}$
(9) $\frac{\omega^2}{s(s^2 + 2\zeta\omega s + \omega^2)}$	$1 - \frac{\omega}{\omega_d} e^{-\zeta\omega t} \sin(\omega_d t + \phi), \phi = \cos^{-1}\zeta, \zeta < 1$
(10) $\frac{1}{s^n}$	$\frac{t^{n-1}}{(n-1)!}, n = 1, 2, \dots$
(11) $\frac{n!}{(s-\omega)^{n+1}}$	$t^n e^{\omega t}, n = 1, 2, \dots$
(12) $\frac{1}{s(s+\omega)}$	$\frac{1}{\omega} (1 - e^{-\omega t})$
(13) $\frac{1}{s^2(s+\omega)}$	$\frac{1}{\omega^2} (e^{-\omega t} + \omega t - 1)$
(14) $\frac{\omega}{s^2 - \omega^2}$	$\sinh \omega t$
(15) $\frac{s}{s^2 - \omega^2}$	$\cosh \omega t$
(16) $\frac{1}{s^2(s^2 + \omega^2)}$	$\frac{1}{\omega^3} (\omega t - \sin \omega t)$
(17) $\frac{1}{(s^2 + \omega^2)^2}$	$\frac{1}{2\omega^3} (\sin \omega t - \omega t \cos \omega t)$
(18) $\frac{s}{(s^2 + \omega^2)^2}$	$\frac{t}{2\omega} \sin \omega t$
(19) $\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$	$t \cos \omega t$
(20) $\frac{\omega_1^2 - \omega_2^2}{(s^2 + \omega_1^2)(s^2 + \omega_2^2)}$	$\frac{1}{\omega_2} \sin \omega_2 t - \frac{1}{\omega_1} \sin \omega_1 t$
(21) $\frac{(\omega_1^2 - \omega_2^2)s}{(s^2 + \omega_1^2)(s^2 + \omega_2^2)}$	$\cos \omega_2 t - \cos \omega_1 t$
(22) $\frac{\omega}{(s+a)^2 + \omega^2}$	$e^{-at} \sin \omega t$
(23) $\frac{s+a}{(s+a)^2 + \omega^2}$	$e^{-at} \cos \omega t$
(24) $F(s-a)$	$e^{at} f(t)$
(25) $e^{-as} F(s)$	$f(t-a) \Phi(t-a)$