

TABLE 2.1 Convolution Table

No.	$x_1(t)$	$x_2(t)$	$x_1(t) * x_2(t) = x_2(t) * x_1(t)$
1	$x(t)$	$\delta(t - T)$	$x(t - T)$
2	$e^{\lambda t} u(t)$	$u(t)$	$\frac{1 - e^{\lambda t}}{-\lambda} u(t)$
3	$u(t)$	$u(t)$	$t u(t)$
4	$e^{\lambda_1 t} u(t)$	$e^{\lambda_2 t} u(t)$	$\frac{e^{\lambda_1 t} - e^{\lambda_2 t}}{\lambda_1 - \lambda_2} u(t) \quad \lambda_1 \neq \lambda_2$
5	$e^{\lambda t} u(t)$	$e^{\lambda t} u(t)$	$t e^{\lambda t} u(t)$
6	$t e^{\lambda t} u(t)$	$e^{\lambda t} u(t)$	$\frac{1}{2} t^2 e^{\lambda t} u(t)$
7	$t^N u(t)$	$e^{\lambda t} u(t)$	$\frac{N! e^{\lambda t}}{\lambda^{N+1}} u(t) - \sum_{k=0}^N \frac{N! t^{N-k}}{\lambda^{k+1} (N-k)!} u(t)$
8	$t^M u(t)$	$t^N u(t)$	$\frac{M! N!}{(M+N+1)!} t^{M+N+1} u(t)$
9	$t e^{\lambda_1 t} u(t)$	$e^{\lambda_2 t} u(t)$	$\frac{e^{\lambda_2 t} - e^{\lambda_1 t} + (\lambda_1 - \lambda_2) t e^{\lambda_1 t}}{(\lambda_1 - \lambda_2)^2} u(t)$
10	$t^M e^{\lambda t} u(t)$	$t^N e^{\lambda t} u(t)$	$\frac{M! N!}{(N+M+1)!} t^{M+N+1} e^{\lambda t} u(t)$
11	$t^M e^{\lambda_1 t} u(t)$	$t^N e^{\lambda_2 t} u(t)$	$\sum_{k=0}^M \frac{(-1)^k M! (N+k)! t^{M-k} e^{\lambda_1 t}}{k! (M-k)! (\lambda_1 - \lambda_2)^{N+k+1}} u(t)$ $+ \sum_{k=0}^N \frac{(-1)^k N! (M+k)! t^{N-k} e^{\lambda_2 t}}{k! (N-k)! (\lambda_2 - \lambda_1)^{M+k+1}} u(t)$
	$\lambda_1 \neq \lambda_2$		
12	$e^{-\alpha t} \cos(\beta t + \theta) u(t)$	$e^{\lambda t} u(t)$	$\frac{\cos(\theta - \phi) e^{\lambda t} - e^{-\alpha t} \cos(\beta t + \theta - \phi)}{\sqrt{(\alpha + \lambda)^2 + \beta^2}} u(t)$ $\phi = \tan^{-1}[-\beta/(\alpha + \lambda)]$
13	$e^{\lambda_1 t} u(t)$	$e^{\lambda_2 t} u(-t)$	$\frac{e^{\lambda_1 t} u(t) + e^{\lambda_2 t} u(-t)}{\lambda_2 - \lambda_1} \quad \text{Re } \lambda_2 > \text{Re } \lambda_1$
14	$e^{\lambda_1 t} u(-t)$	$e^{\lambda_2 t} u(-t)$	$\frac{e^{\lambda_1 t} - e^{\lambda_2 t}}{\lambda_2 - \lambda_1} u(-t)$