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INSTITUTO FEDERAL DE EDUCAÇÃO, CIÊNCIA E TECNOLOGIA DE SANTA CATARINA
CURSO SUPERIOR DE TECNOLOGIA EM SISTEMAS DE TELECOMUNICAÇÕES
Área de Conhecimento: Análise de Circuitos III

Exercícios de Transformada de Laplace

<u>1ª Questão</u>: Determine a transformada de Laplace de cada uma das funções no tempo.

a) $f(t) = \cos(wt + 90^o) \cdot u(t)$

b) $f(t) = sen(wt + 45^o) \cdot u(t)$

c) $f(t) = e^{-2t} \cdot \cos 3t \cdot u(t)$

d) $f(t) = e^{-2t} \cdot sen 4t \cdot u(t)$

e) $f(t) = e^{-3t} \cdot \cosh 2t \cdot u(t)$

f) $f(t) = e^{-4t} \cdot senh\, t \cdot u(t)$

g) $f(t) = t \cdot e^{-t} \cdot sen 2t \cdot u(t)$

h) $f(t) = 3 \cdot t^4 \cdot e^{-2t} \cdot u(t)$

i) $f(t) = \left[2 \cdot t - 4\dfrac{d}{dt}\partial(t) \right] \cdot u(t)$

j) $f(t) = 6 \cdot e^{-\frac{t}{3}} \cdot u(t)$

k) $f(t) = 10 \cdot u(t - 2)$

l) $f(t) = (t + 4) \cdot u(t)$

m) $f(t) = 10 \cdot t \cdot u(2t)$

n) $f(t) = e^{-5t}(t^4 + 2t^2 + t) \cdot u(t)$

o) $f(t) = (5e^{2t} - 3)^2 \cdot u(t)$

p) $f(t) = 4 \cdot \cos^2 2t \cdot u(t)$

q) $f(t) = e^{-4t} \cdot (\cos 3t + sen 3t) \cdot u(t)$

r) $f(t) = [2 + \partial(t) - 2 \cdot sen 3t] \cdot u(t)$

s) $f(t) = t \cdot sen\, t \cdot u(t)$

<u>2ª Questão</u>: Determine a transformada inversa de Laplace de cada uma das funções abaixo.

a) $F(s) = \dfrac{6 \cdot s}{s^2 + 36}$

b) $F(s) = \dfrac{6 \cdot e^{-3t}}{s^2 + 1}$

c) $F(s) = \dfrac{12}{(s+2)^5}$

d) $F(s) = \dfrac{2s^2 + s + 2}{s^2 + 4}$

e) $F(s) = \dfrac{2s + 2s + 1}{(s+2)(s+1)^2}$

f) $F(s) = \dfrac{1}{s^2 - 4s + 5}$

g) $F(s) = \dfrac{e^{-s}}{(s-5)^3}$

h) $F(s) = \dfrac{2s + 4}{s^2 - 4s + 4}$

i) $F(s) = \dfrac{2(s+10)}{(s+1)(s+4)}$

j) $F(s) = \dfrac{3s^2 + 8s + 8}{(s+2)(s+1)^2}$

k) $F(s) = \dfrac{4s + 1}{(s+2)(s+1)^2}$

l) $F(s) = \dfrac{4s^2 + 37s + 73}{(s+2)(s^2 + 8s + 15)}$

m) $F(s) = \dfrac{s^2 + 12}{s(s+2)(s+3)}$

n) $F(s) = 10 + \dfrac{s+1}{s^2 + 4}$

o) $F(s) = \dfrac{s^2 + 4s}{s^2 + 10s + 26}$

p) $F(s) = \dfrac{9s^2}{s^2 + 4s + 13}$

q) $F(s) = \dfrac{1}{s(s+1)(s^2 + 6s + 10)}$

GABARITO

a) $\quad F(s) = \dfrac{-\omega}{s^2 + \omega^2}$

b) $\quad F(s) = \dfrac{\sqrt{2}}{2}\left(\dfrac{s+\omega}{s^2+\omega^2}\right)$

c) $\quad F(s) = \dfrac{s+2}{(s+2)^2+9}$

d) $\quad F(s) = \dfrac{4}{(s+2)^2+16}$

e) $\quad F(s) = \dfrac{s+3}{(s+3)^2-4}$

f) $\quad F(s) = \dfrac{1}{(s+4)^2-1}$

g) $\quad F(s) = \dfrac{4s+4}{\left(s^2+2s+5\right)^2}$

h) $\quad F(s) = \dfrac{72}{(s+2)^5}$

i) $\quad F(s) = \dfrac{2}{s^2}-4s$

j) $\quad F(s) = \dfrac{6}{s+1/3}$

k) $\quad F(s) = \dfrac{10}{s}e^{-2s}$

l) $\quad F(s) = \dfrac{1}{s^2}+\dfrac{4}{s}$

m) $\quad F(s) = \dfrac{20}{s^2}$

n) $\quad F(s) = \dfrac{24}{(s+5)^5}+\dfrac{4}{(s+5)^3}\dfrac{1}{(s+5)^2}$

o) $\quad F(s) = \dfrac{25}{s-4}-\dfrac{30}{s-2}+\dfrac{9}{s}$

p) $\quad F(s) = \dfrac{2}{s}+\dfrac{2s}{s^2+16}$

q) $\quad F(s) = \dfrac{s+7}{(s+4)^2+9}$

r) $\quad F(s) = 1+\dfrac{2}{s}-\dfrac{6}{s^2+9}$

s) $\quad F(s) = \dfrac{2s}{s^4+2s^2+1}$

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a) $\quad f(t) = 6\cos 6t \cdot u(t)$

b) $\quad f(t) = 6\,sen\,t \cdot u(t)$

c) $\quad f(t) = \dfrac{t^4 \cdot e^{-2t}}{2}\cdot u(t)$

d) $\quad f(t) = [2\delta(t)+\cos 2t - 3sen2t]\cdot u(t)$

e) $\quad f(t) = \left(-7e^{-2t}+7e^{-t}-3t\cdot e^{-t}\right)\cdot u(t)$

f) $\quad f(t) = e^{2t}\cdot sen\,t \cdot u(t)$

g) $\quad f(t) = \left[0{,}5(t-1)^2 \cdot e^{5(t-1)}\right]\cdot u(t-1)$

h) $\quad f(t) = \left(2e^{2t}+8t\cdot e^{2t}\right)\cdot u(t)$

i) $\quad f(t) = \left(6e^{-t}-4e^{-4t}\right)\cdot u(t)$

j) $\quad f(t) = \left(4e^{-2t}-e^{-t}+3t\cdot e^{-t}\right)\cdot u(t)$

k) $\quad f(t) = \left(-7e^{-2t}+7e^{-t}-3t\cdot e^{-t}\right)\cdot u(t)$

l) $\quad f(t) = \left(5e^{-2t}+e^{-3t}-2e^{-5t}\right)\cdot u(t)$

m) $\quad f(t) = \left(2-8e^{-2t}+7e^{-3t}\right)\cdot u(t)$

n) $\quad f(t) = \left(11\delta(t)-\dfrac{3}{2}sen2t\right)\cdot u(t)$

o) $\quad f(t) = \left[\delta(t)+e^{-5t}\cdot(4sent-6\cos t)\right]\cdot u(t)$

p) $\quad f(t) = \left[98t - e^{-2t}(36\cos 3t+15sen3t)\right]\cdot u(t)$

q) $\quad f(t) = \left[\dfrac{1}{10}+\dfrac{e^{-t}}{5}+e^{-3t}\cdot(sent+\cos t)\right]\cdot u(t)$