

"Elektrijada 2012, oblast I, zadatak 2, maj 2012";

ClearAll;

Remove[UC, I2, GC, gC, J1, J2];

"Oznake: I1 struja kroz otpornik na ulazu, s leva na desno;";

"I2 struja kroz krajnji desni otpornik, odozgo prema dole;";

"I3 struja kroz srednji levi otpornik, s leva na desno;";

"I4 struja kroz srednji desni otpornik, s leva na desno;";

"c*s*UC struja kroz kondenzator, s leva na desno;";

et1 = 6*Exp[-t];

et2 = -6*Exp[-t];

I4 = I2 - CC*s*UC;

I3 = I4 - $\frac{UC}{R}$;

I1 = I2 - $\frac{UC}{R}$;

J1 = $\frac{1}{s}$ - R*(I1 + I2 + I3 + I4);

J2 = UC - R*(I3 + I4);

Res = Flatten[Solve[{J1 == 0, J2 == 0}, {UC, I2}]];

Print["GC(s) = ", GC = Together[UC /. Res], " ."]

R = 1;

CC = 1;

Print["gC(t) = ", gct = InverseLaplaceTransform[GC, s, t], " V/V."]

$$GC(s) = \frac{1}{2s(1+CCRs)}.$$

$$gC(t) = \frac{1}{2} (1 - e^{-t}) V/V.$$

P0 = (et1 /. t -> 0) * gct;

D1 = ∂_x (et1 /. t -> x) * gct /. t -> t - x;

D2 = ∂_x (et2 /. t -> x) * gct /. t -> t - x;

D1Int = FullSimplify[$\int_0^t D1 dx$];

D1IntT = FullSimplify[$\int_0^{\text{Log}[2]} D1 dx$];

D2Int = FullSimplify[$\int_{\text{Log}[2]}^t D2 dx$];

et2T = et2 /. t -> Log[2];

et1T = et1 /. t -> Log[2];

gctT = Simplify[gct /. t -> t - Log[2]];

Print["uc(t) = ", uc1 = Simplify[P0 + D1Int], " V, za 0 ≤ t ≤ T."]

Print["uc(t) = ", uc2 = FullSimplify[P0 + D1IntT + (et2T - et1T) * gctT + D2Int], " V, za T ≤ t < ∞."]

$$uc(t) = 3e^{-t}t V, \text{ za } 0 \leq t \leq T.$$

$$uc(t) = -3e^{-t}(t - \text{Log}[4]) V, \text{ za } T \leq t < \infty.$$