Amir Arsalan Yavari HW6

Using the partition theorem, we will solve the problem. If a failure is covered (i.e., fault detected and using the spare component), since our spare component is a hot spare and works in synchronization with the primary, the reliability formula will be the same as the reliability of a parallel system.

R(Tsys | I=1) = Rp(t) + Rs(t) - Rp(t)*Rs(t)

If no fault is detected, then the system's reliability is equal to the reliability of the primary component.

R(Tsys | I=0) = Rp(t)

So the reliability of the entire system is equal to:

R(Tsys) = C * R(Tsys | I=1) + (1 - C) * R(Tsys | I=0)

Now I define the variables values based on the problem.

lambda := 50;
C_values := [*seq*(*i*, *i* = 0 .. 1, 0.1)];

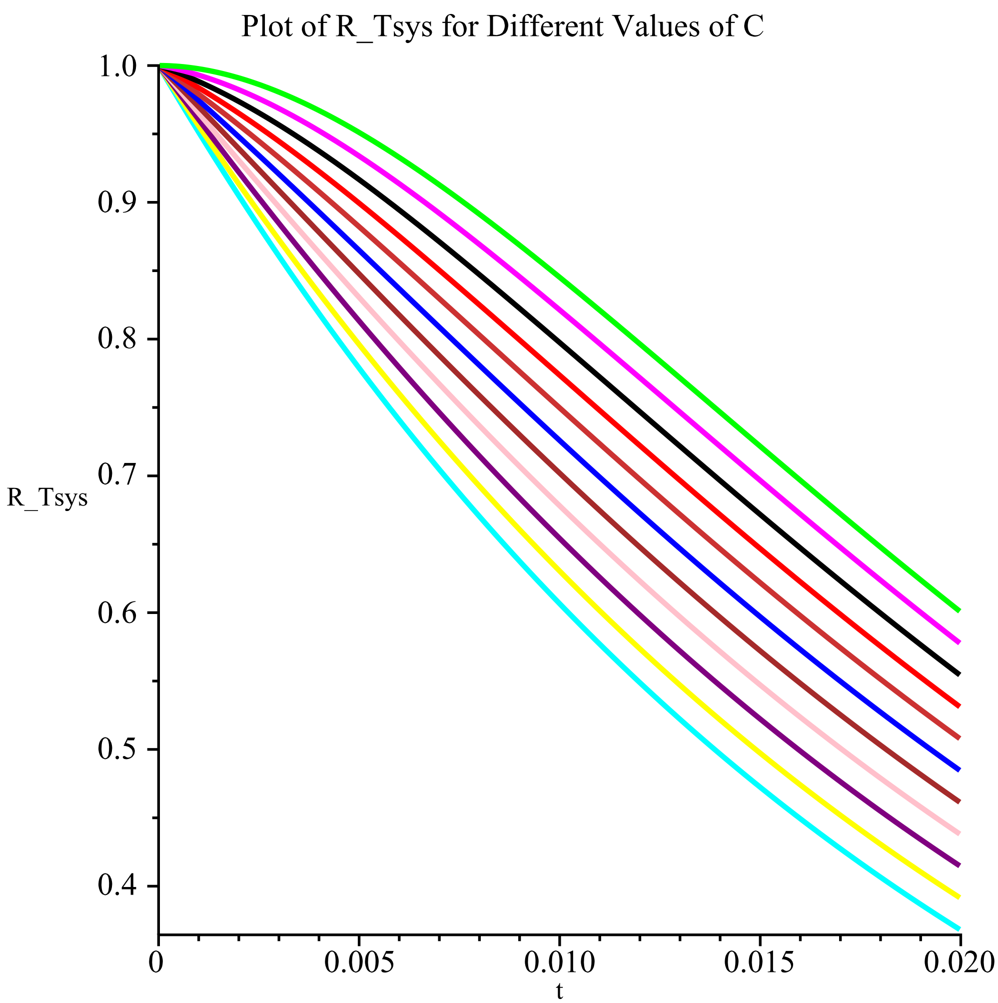
$$\lambda := 50$$

$$C\_values := [0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0] \quad \textbf{(1)}$$

color_list := [*cyan*, *yellow*, *purple*, *pink*, *brown*, *blue*, *orange*, *red*, *black*, *magenta*, *green*];
R(*Tsys*) := (*C*, *t*) → *C* * (2 * exp(K lambda * *t*) K exp(K 2 * lambda * *t*)) + (1 K *C*) * exp(K lambda * *t*);
combined_plot := *plot*([*seq*(***R***(*Tsys*)(*C*, *t*), *C* = *C_values*)], *t* = 0 .. 0.02, *title* = "Plot of R_Tsys for Different Values of C", *labels* = ["t", "R_Tsys"], *color* = *color_list*, *thickness* = 2);

$$color\_list := [cyan, yellow, purple, pink, brown, blue, orange, red, black, magenta, green]$$

$$\boldsymbol{R} := Tsys \mapsto (C, t) \mapsto C \cdot \left(2 \cdot \mathrm{e}^{K\, \lambda \cdot t} K\ \mathrm{e}^{K\, 2 \cdot \lambda \cdot t}\right) + (1 K\ C) \cdot \mathrm{e}^{K\, \lambda \cdot t}$$



I plot the chart in range 0 to 0.02 becuse of the lambda value is 50.