University of Chemistry and Technology
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Department of Mathematics,
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Control Theory
Assignment #1

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1. Using Laplace transform, solve $y''(t) + 19y'(t) + 90y = 1 + 2e^{-t}$ for $y(t)$, given the initial conditions $y(0) = 1$ and $y'(0) = 1$. Confirm your solution using MATLAB.

2. Find the steady-state value for the system that is described by the differential equation above.

3. You are given a transfer function:

$$H(s) = \frac{1}{2s^2 + 18s + C}$$

   Find the interval of C for which the system is stable using the knowledge of the poles placement in the complex plane, using the Hurwitz criterion, and using the Routh-Shur criterion.

   Note: Since the poles are placed in the complex domain, remember to expand all your calculations to the complex domain as well!

4. Using MATLAB, for the $H(s)$ given above and $C = 392$, find the *rise time*, *settling time*, *peak time*, *peak value*, and *overshoot*. Also, plot the *impulse response* and *step response*.