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KON 326E

COMPUTER CONTROLLED SYSTEMS
PROJECT – 1

1. In continuous systems *Laplace transform* plays a unique role. That transform allows system and circuit designers to analyze systems and predict performance, and to think in different terms to help understand linear continuous systems. *z-transform* plays the role in sampled systems that *Laplace transform* plays in continuous systems.

Prepare a report for ***z-transform*** that includes:

- Definition
- Properties (with proofs)
- The role of z-transform to solve difference equations (with examples).

2. Determine the inverse *z-transform* of the following discrete time system with using the *Inverse Transform Integral (Contour Integral with using Residue Theorem).*

$$X\ z\ = \frac{20}{(z-1)(z-2)}$$

3. Assuming that:

$$u\ k\ = 1 \qquad k = 0,1,2,\ldots$$

solve the difference equation:

$$x\ k+2\ - x\ k+1\ + 0.25x(k) = u(k+2)$$

with the initial conditions $x\ 0\ = 1$ and $x\ 1\ = 2$.

a) Analytically
b) Numerically (Hint: You can use MATLAB for calculations.)

4. Continuous time transfer function of a system is given as follows:

$$X\ s\ = \frac{3s+9}{(s+1)(s+2)}$$

determine the discrete time transfer function of the system.

5. Analytically obtain the *z-transform* of the following equation.

$$X\ s\ = \frac{1-e^{-Ts}}{s}\frac{2}{(s+a)^2}$$

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