EEE201
Circuit Analysis II

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Introduction to the Laplace Transform

EEE201 Circuit Analysis II

Lecture 10

Agenda

- Inverse Transforms
- Poles and Zeros of F(s)
- Initial and Final Value Theorems

Inverse Transforms

$$F(s) = \frac{N(s)}{D(s)} = \frac{a_n s^n + a_{n-1} s^{n-1} + \cdots + a_1 s + a_0}{b_m s^m + b_{m-1} s^{m-1} + \cdots + b_1 s + b_0}$$

$$m > n \implies proper\ rational\ function$$

$$m \leq n \implies improper\ rational\ function$$

Poles and Zeros of F(s)

$$F(s) = \frac{K(s+z_1)(s+z_2)\ \ldots\ (s+z_n)}{(s+p_1)(s+p_2)\ldots\ (s+p_m)}$$

K is the constant a_n/b_m.

$-z_1, -z_2, -z_3$, … are the zeros of $F(s)$.

$-p_1, -p_2, -p_3$, … are the poles of $F(s)$.

Initial and Final Value Theorems

Initial value theorem:

$$\lim_{t \to 0} f(t) = \lim_{s \to \infty} sF(s)$$

Final value theorem:

$$\lim_{t \to \infty} f(t) = \lim_{s \to 0} sF(s)$$

Reference

- Electric Circuits, Tenth Edition, James W. Nilsson, Susan A. Riedel Pearson, 2015