EE483 Discussion

Finals:
- No tricky problem (easier than HW)
- Concept!
- Time/location will be announced later.

Review:
- Suggestion:

- Stick on the notes
- do not work on too hard prob.
- Fluent in basic operation.
  - Simple 2-trans. Inv 2-trans
  - windowing FIR design
- basic Filter implementation
\[ H(z) = \sum_{n=-\infty}^{\infty} h(n) z^{-n} \]

\[ \text{ROC: } R_1 < |z| < R_2 \]

**Properties:**

\[ \frac{1}{1 - a z^{-1}} \]

\[ \text{ROC: } |z| > a \]

\[ \text{ROC: } |z| < a \]

\[ \text{ROC: } R_1 < |z| < R_2. \]

- Inverse and transpose form
- Residue theorem
- Partial decomposition

\[ P_{10} - 10. \]

\[ y(n) = x(n) * h(n) \]

\[ = \sum_{m=-\infty}^{\infty} x(m) h(n-m) \]
Z-domain

\[ Y(z) = X(z) \cdot H(z). \]

Poles & Zeros

- Definitions, see (7.50)
- Relation to freq response.

\[ |z| = 1 \]
\[ z = e^{j\omega} \]

Digital filters

- Filter types, spec.

\[ H(e^{j\omega}) = |H(e^{j\omega})| \cdot e^{j\phi(\omega)} \]
- Magnitude/phase response
- Linear phase \( \phi(\omega) = -a\omega \)
ISR | FIR

- convenient | stable
- performance | linear phase
- good/reliable | flexible shaping
- monotone | convenient to implement

FIR.

spec. → ideal

freq. → invert to time

inf. → windowing

different kind.

finite / shift → causal.
**Example**

\( H(\tau) \) linear phase FIR.

\[ G(\tau) = \frac{1}{H(\tau)}, \text{ causal, stable?} \]

Sol:

* \( G(\tau) \) is **IIR**.

* FIR with linear phase,

\( h(n) \) is symmetry

\( H(\omega)'s \) zeros is symmetry to the u.e.

* Cannot be causal, stable at the same time.
IIR.
  - Analog domain design.
    - Type: Butterworth
      - Ch. 1, 2.
  - Freq. transformations
    - Type: LP $\rightarrow$ HP
      - Domain: Analog $\rightarrow$ Digital domain

Realizations $\rightarrow$ Notes.

Bilinear trans.

Homework problems.