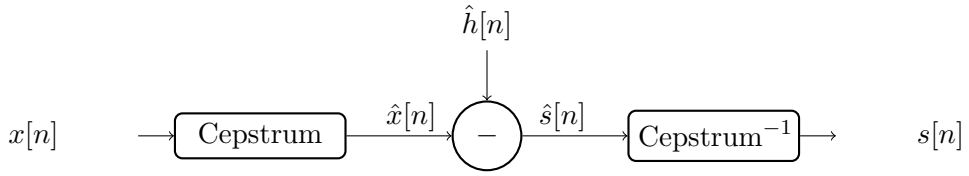
ECE 417, Spring 2016: Exam 1 Solutions

Problem 1 (15 points)



- **Cepstrum:** $\hat{x}[n] = \mathcal{Z}^{-1}\left\{\ln \mathcal{Z}\left\{x[n]\right\}\right\}$
- **Subtract:** $\hat{s}[n] = \hat{x}[n] - \hat{h}[n]$
- **Cepstrum^{-1}:** $s[n] = \mathcal{Z}^{-1}\left\{\exp \mathcal{Z}\left\{\hat{s}[n]\right\}\right\}$

Problem 2 (15 points)

$$\hat{x}[n] = \hat{s}[n] + \sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k} (0.9)^k \, \delta[n - 80k]$$

Problem 3 (20 points)

$$k_m = \frac{700N}{F_s} \left(\left(1 + \frac{F_s}{1400} \right)^{m/M} - 1 \right)$$

Problem 4 (30 points)

1. $U^T \vec{u}_3 = [0, 0, 1, 0, \ldots, 0]^T$
2. $V \propto AU$ (any constant of proportionality is an acceptable answer).

Problem 5 (20 points)

$$\sum_{k=1}^{K} \lambda_k = (0.95) \sum_{k=1}^{M} \lambda_k$$