

Lecture 10: Exam 1 Review

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ECE 417: Multimedia Signal Processing, Fall 2023

1 Test Administration

2 Test Content

3 Sample Problems

Outline

- 1 Test Administration
- 2 Test Content
- 3 Sample Problems

Test Administration

- Exam 1 will be in class, Tuesday, 9/26
- If you need an online exam or a conflict exam, please contact Prof. Hasegawa-Johnson by the end of Friday, 9/22

What to Bring

- Pencils and erasers
- One page of notes, front and back, handwritten or 12pt font
- No calculators, computers, cell phones, smart speakers, earpods, or other devices capable of communicating with your AI or human tutor
- Exam will provide a formula sheet—the same one that's on the practice exam online

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What's on the Exam

The exam has four questions:

- One question based on HW1 (linear algebra & pseudo-inverse)
- One question based on MP1 (barycentric coordinates & bilinear interpolation)
- One question based on HW2 (signal processing & STFT)
- One question based on MP2 (Griffin-Lim)

What's on the Exam

- Content is from lectures 1-6, including only the material that actually made it onto HW1-2 and MP1-2
- Lecture 7 is sort of on the exam, and sort of not. The exam will include MMSE affine transforms. I think the easiest way to find the MMSE affine transform is using the derivations in lecture 7. So for that reason, I recommend that you also learn lecture 7's material.

One question based on HW1 (linear algebra & pseudo-inverse)

- Eigenvalues, eigenvectors, singular values & singular vectors are **NOT** on the exam, because they weren't on the HW
- Other things from lecture 1 are covered, e.g., determinant
- Algebraic forms of pseudo-inverse will be covered, including:
 - MMSE approximation using the pseudo-inverse of a tall thin matrix
 - Orthogonal projection using the pseudo-inverse of a short fat matrix

One question based on MP1 (barycentric coordinates & bilinear interpolation)

- You should know how to convert cartesian coordinates to/from barycentric coordinates, and how to tell which triangle contains a point
- You should know how to use bilinear interpolation to find the color of a point between the input points

One question based on HW2 (signal processing & STFT)

- Understand DTFT and DFT, impulses in both time and frequency, rectangles in both time and frequency
- Know that Hamming, Hann & Bartlett windows have a main lobe twice as wide as a rectangular window, with much lower sidelobes
- Understand forward STFT, and OLA method of inverse STFT, including reasons why $\sum_m w[n - m]$ is usually a constant (and cases in which the constant might not be 1)

One question based on MP2 (Griffin-Lim)

- Conjugate-symmetry constraint, overlapped-samples constraint
- Zero-phase, random phase, correct phase
- Understand the interpretation of Griffin-Lim as a sequence of orthogonal projections
- Understand Griffin-Lim as a sequence of $\text{angle}(\text{STFT}(\text{ISTFT}))$ operations

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Sample Problems

- You are welcome to do any sample problems you find online, including any previous exams from this course.
- I've collected the problems I consider most relevant into the online practice exam.
- It's much longer than the real exam will be.