

Solutions to EECS 206 Exam 1, 2003-2-6

Regrade requests must be submitted to Prof. Fessler within 1 week of when the exam was returned in your lab section, with a written cover sheet explaining the request clearly. All problems will be re-examined, and scores may increase or decrease.

Discussing the exam with a professor or GSI nullifies the opportunity to submit a regrade request.

No partial credit was given except where indicated below. In particular, "multiple answer" problems that had only one correct answer had to be answered exactly correctly.

(There were multiple versions of the exam so the solutions below may not be in the same order as your exam.)

1. (9)

$$(b). M(x) = \frac{1}{6} \int_0^6 x(t) dt = 4/6 = 2/3 \quad (HW 1-2, 2-1)$$

2. (9)

$$(c). A^2/2(2/3) = 6^2/3 = 12 \quad (HW 2-1)$$

3. (9)

$$(f). y[n] = 7 \cos(2\pi \frac{8}{5}n + \phi_1) - 7\pi \cos(2\pi \frac{1}{4}n + \phi_2). \text{ LCM}(4,5) = 20. \text{ So the fund. freq. is } 1/20. \quad (HW 2-3)$$

4. (9)

$$(d)(f). T_1 = 4, T_2 = 6 \text{ so the least common multiple is } T_0 = 12. \text{ All periods are multiples of } T_0. \quad (HW 2-3)$$

Grading: 9 if (d)(f), 5 if (d) only, 0 otherwise.

5. (9)

$$(c). \text{ The RMS value is unchanged by time scale/shift.} \quad (HW 2-5)$$

6. (9)

$$(a)(f). 6e^{-j\pi/2} + 4e^{j\pi/2} = -6j + 4j = -2j = 2e^{-j\pi/2} \text{ so } x(t) = 4 + 2 \cos(\pi t + \phi).$$

$$\text{Thus MS}(x) = 4^2 + 2^2/2 = 18.$$

(HW 2-7,4-5)

7. (9)

$$(f). C(x, x(\cdot - 1)) = \int x(t) x(t - 1) dt = 6. \quad (HW 3-2)$$

8. (9)

$$(b),(d),(f). \text{ For } t_0 = -1, 1, 3, \int x(t) x(t - t_0) dt = 0.$$

(HW 4-1)

Grading: +3 points for each correct choice, -3 points for each incorrect choice.

9. (9)

$$(c). \int x_2(t) y_2(t) dt = \int x_1(2t) y_1(2t) dt = \int x_1(s) y_1(s) \frac{ds}{2} = \frac{1}{2} C(x_1, y_1) = 8, \text{ where } s = 2t. \quad (HW 2-5,3-2)$$

10. (9)

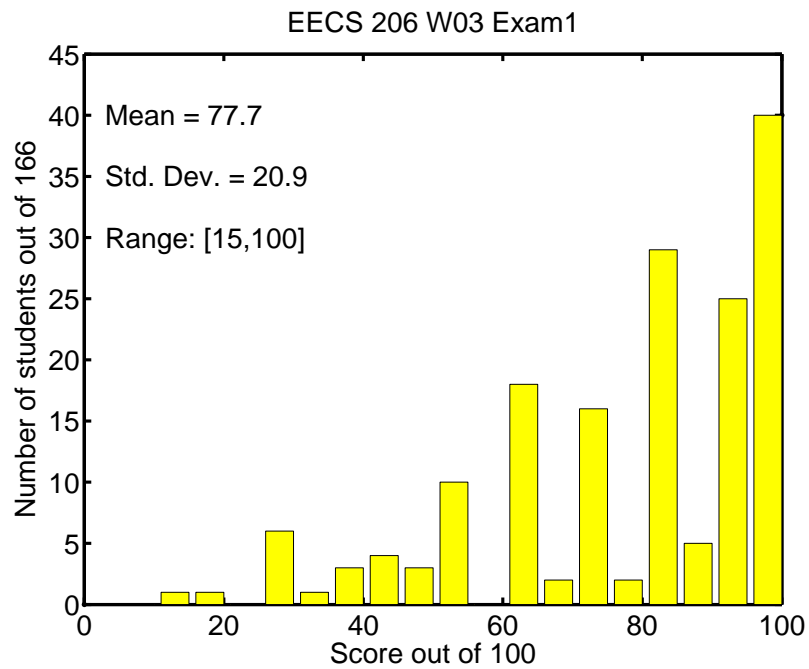
$$(f). 2e^{j\pi/6} + 2e^{-j\pi/2} - 5e^{-j\pi/6} = 2(\sqrt{3}/2 + j\frac{1}{2}) - 2j - 5(\sqrt{3}/2 - j\frac{1}{2}) = -3\sqrt{3}/2 + j\frac{3}{2} = 3e^{j5\pi/6}. \quad (HW 4-5)$$

11. (10)

$$(b). \text{MS}(x + y) = \frac{1}{5} \int_2^7 [x(t) + y(t)]^2 dt = \frac{1}{5} E(x) + \frac{2}{5} C(x, y) + \text{MS}(y) = 2 + 4 + 5 = 11.$$

(HW 3-5)

166 students, mean=77.7 std=20.9



Rough grades:

90+ A

80+ B+ / B

70+ B- / C+

65+ C

60+ C-

59- D's and F's

For elaboration on these solutions, please come to office hours.