Signal Processing (İkinci Öğretim)
Final Exam

Istanbul University - Computer Engineering Department - FALL 2016

December 29th, 2016

PLEASE READ: The duration for this exam is **80** minutes. Please answer the questions in ENGLISH briefly and clearly. **Bad handwriting, unclear statements, ambiguous answers will result in credit loss**. You may bring one calculator, an A4 sized formula-sheet and a copy of Appendix A from the book to the exam. The formula-sheet MUST NOT contain any problems and solutions. (If you do not have a formula-sheet, please let the attending Assistant know). Every other material is forbidden. Sharing of materials is not allowed and will be considered cheating if done so. Please read the questions before solving them. Please RETURN your exam papers and your A4 formula-sheets at the end of the examination. DO NOT RETURN the copy of Appendix A. This test has total of **100** points worth of questions. Anyone attempting to cheat, help someone else to cheat or make an effort to do these will receive 0 points for the exam and will be reported to the Dean's office. Good Luck. (Mustafa Dağtekin)

Q1: `(25pts)` Find the DISCRETE TIME convolution sum of the following two signals.

$$x[n] = 3^n \times u[-n+3]$$
$$h[n] = u[n-2]$$

Q2: `(25 pts)` Find the CONTINUOUS TIME convolution integral of the following two signals.

$$x(t) = u(t+3)$$
$$h(t) = e^{-3t} \times u(t)$$

Q3: Consider the following LTI system. Answer the following questions

$$y(t) = x(t-3) + \int_{-\infty}^{t} x(\tau+1)\,\mathrm{d}\tau$$

(a) `(15 pts)` Find the impulse response for this system.

(b) `(15 pts)` Find the step response for this system.

Q4: Based on the impulse response, $h[n]$, given in Q1, determine if the corresponding system is (a) `(3 pts)` Memoryless (You must show your work to receive credit) (b) `(3 pts)` Causal (You must show your work to receive credit) (c) `(4 pts)` Stable (You must show your work to receive credit).

Q5: Based on the impulse response, $h(t)$, given in Q2, determine if the corresponding system is (a) `(3 pts)` Memoryless (You must show your work to receive credit) (b) `(3 pts)` Causal (You must show your work to receive credit) (c) `(4 pts)` Stable (You must show your work to receive credit).