Signal Processing (Örgün Öğretim)
Midterm Make-Up Exam

Istanbul University - Computer Engineering Department - FALL 2017

December 5^{th}, 2017

PLEASE READ: The duration for this exam is **70** 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. 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: Consider the following DISCRETE TIME signal. Answer the following questions.

$$x[n] = \sum_{k=-3}^{3} k\ \delta[n-k]$$

Aşağıdaki soruları cevaplayınız.

(a) `(20 pts)` Carefully sketch $x[n]$.

(b) `(20 pts)` Is $x[n]$ an even signal, odd signal or neither?

(c) `(20 pts)` Carefully sketch $x[3n-3] + x[2n+2]$.

Q2: Consider the following DISCRETE TIME system. Answer the following questions.

$$y[n] = \mathcal{H}_1\{x[n]\} = \sum_{k=-1}^{1} k\ x[n-k]$$

(a) `(10 pts)` Is $\mathcal{H}_1$ linear? Show your work.

(b) `(10 pts)` Is $\mathcal{H}_1$ time-invariant? Show your work.

Q3: Consider the following CONTINUOUS TIME system. Answer the following questions.

$$y(t) = \mathcal{H}_2\{x(t)\} = \int_{-\infty}^{t} t\ x(\tau)\ \mathrm{d}\tau$$

(a) `(10 pts)` Is $\mathcal{H}_2$ stable? Show your work.

(b) `(10 pts)` Is $\mathcal{H}_2$ linear? Show your work.