LUNDS TEKNISKA HÖGSKOLA
Inst. för Elektro- och Informationsteknik

Signal Processing in Multimedia, EITA50, 2017
Task 1 (out of 2)

Deadline: Complete the task before until Thursday, 19:th of Oct, at 18:00.

Observe: In order to simplify the correction:
-Only solve one problem per paper sheet.
-Please write your name on every paper sheet.
Statements must be motivated by reasoning and/or equations.
The points from the tasks will be added to the examination score.
Max Tot. score (exam + 2 tasks) = 5.0 + 0.5 + 0.5 = 6.0
Grading; 3 (≥3.0p), 4 (≥4.0p), 5 (≥5.0p).

1. Indicate which of the following statements are correct and which are false. Requires 5 correct answers out of 6. **(0.1p)**

   a) A causal FIR-filter has at least as many poles as zeros!

   b) Recursive systems has all poles in the point of origin!

   c) Recursive systems are always instable!

   d) An LTI-system always has a linear-phase function!

   e) An FIR-filter always has a linear-phase function!

   f) An IIR-filter never has a linear-phase function!

2. A discrete-time system is describbed by the following difference-equation,

$$y(n) = 0.5y(n-1) + x(n) + 2x(n-1)$$

   a) Draw the corresponding pole-zero diagram and determine the impuls response, $h(n)$. **(0.1p)**

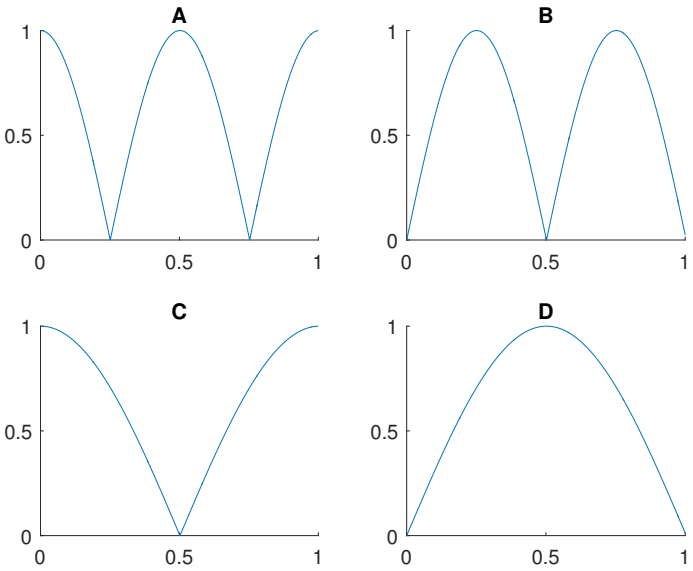
   b) Determine the output signal $y(n)$ if the input signal is $x(n) = cos(2\pi 0.25n)$ for all n. **(0.1p)**

3. Below we have 4 input-output relations (1-4) and 4 amplitude spectra $|H(f)|$ (A-D) for $0 \leq f \leq 1$.

   a) Pair the input-output relations (1-4) with the corresponding amplitude spectra (A-D)! **(0.1p)**

   b) Let the input be $x(n) = 1 + cos(2\pi \frac{1}{4} n)$, determine for every system (1-4) the corresponding output! **(0.1p)**

1. $y(n) = 0.5 \cdot (x(n) + x(n-2))$
2. $y(n) = 0.5 \cdot (x(n) - x(n-2))$
3. $y(n) = 0.5 \cdot (x(n) - x(n-1))$
4. $y(n) = 0.5 \cdot (x(n) + x(n-1))$


A
B
C
D
1
0.5
0
0
0.5
1