

Indian Institute of Science

E9-252: Mathematical Methods and Techniques in Signal Processing

Instructor: Shayan G. Srinivasa

Home Work #1, Spring 2020

Late submission policy: Points scored = Correct points scored $\times e^{-d}$, $d = \#$ days late

Assigned date: Jan. 31st 2020

Due date: Feb. 11th 2020 in class

PROBLEM 1: Derive the convolution operator for an LTI system that works with continuous time signals. Arrive at the discrete version via sampling. Show all your steps carefully. (7 pts.)

PROBLEM 2: We are given a mixture of N sinusoid signals of the form $y[n] = \sum_{i=1}^N A_i \sin(\omega_i n + \phi_i)$. What is the governing difference equation? How many measurements are needed to determine the unknown amplitude, frequency and phase? Solve for the unknowns explicitly. Do a simulation exercise for this problem based on theoretical setup and validate your results. (13 pts.)

PROBLEM 3: Solve 1.4-18 from Moon and Stirling. (15 pts.)

PROBLEM 4: Solve problems 2.2-30, 2.3-37 and 2.4-42 from Moon and Stirling. (15 pts.)