Assignment 1

Digital Signal Processing (EC- 335)

Department of Mechatronics Engineering, CEME, NUST

Deadline: 23-10-2025

Question 1: Find the output of DTLTI system, if the input and impulse response of the system is given as follows:

i) $x[n] = \left(\frac{1}{5}\right)^n u[n]$, $h[n] = 3^n u[n]$

ii) $x[n] = (0.6)^n u[n]$, $(0.2)^n u[n]$

(10 marks)

Question 2: Test whether the following DT systems are linear or not: (10 marks)

(a) $y[n] = x^2[n]$
(b) $y[n] = x[4n + 1]$
(c) $y[n] = x[n] + 1/x[n + 1]$
(d) $y[n] = x[n^2]$
(e) $y[n] = x[n] + nx[n + 1]$
Also test the above for LTI system (10 marks)

Question 3:

(i). What is the difference between time domain and Frequency domain? Write down the pros and cons of analysis in the aforesaid domains. (5 marks)

(ii). Write down the applications of Transducers and Digital Signal Processing in Mechatronics Engineering. (5 marks)