

## Classwork 20

FA24

VAH

CPE381

Instructor: Rahul Bhadani

Name of the Student:

Total Marks: 10 points

Q1. Remember infinite Geometric progression is written as

$$S_{\infty} = a + ar + ar^2 + \dots \quad |r| < 1$$
$$= \frac{a}{1-r}$$

Now, consider a system:

$$y[n] = \frac{1}{3}(x[n+1] + x[n] + x[n-1])$$

(a) Is the system given by  $y[n]$  causal?  
why or why not? (2.5 points)

(b) Is it BIBO stable? (2.5 points)

Q2. Sampled signal can be written as:

$$x(t) = \sum_n x(nT_s) \delta(t - nT_s)$$

(a) Knowing the delayed version of a signal results in a phase change (or a multiplication by complex exponential), write down the expression  $X(s)$  where  $X(s)$  is the Laplace transform of  $x(t)$

Given  $\mathcal{L}(\delta(t)) = 1$

$$\mathcal{L}(x(t-A)) = X(s)e^{-As}$$

(2.5 points)

(b) In the expression of  $X(s)$  you obtain, do variable substitution by assuming a new variable  $z = e^{sT_s}$ , and write  $X(s)$  as a function of  $z$ . (2.5 points)