EE 200: Quiz 3
Duration 60 Minutes

Use the following format of answering:

Name: **Roll No:** **Section:**

Email: **WhatsApp no:**

*Write **only** the final answer in each question. There are total 5 questions and all questions carry equal marks. Answer scripts submitted after 60 minutes will be penalized with negative marks. The submission channel will be closed at completion of 60 minutes.*
Note: In case you are submitting via email due to any reason, send your answer file only to the TA's of your section. Please do not send it to the tutor.

1. A sequence $x[n]$ is generated by uniformly sampling the analog sinusoidal signal $\tilde{x}_a(t) = \cos(30\pi t)$.
   (a) Determine the sampling period T so that $x[n]$ is a periodic sinusoidal sequence.
   (b) Determine the fundamental period N_0 of $x[n]$ if $T = 0.06$ sec.

2. Consider the causal LTI digital system characterized by the first-order difference equation given by

   $$y[n] + \alpha y[n-1] = \alpha x[n-1]$$

   where $y[n]$ is the output sequence, $x[n]$ is the input sequence, and $|\alpha| < 1$. Find the impulse response $h[n]$ of the system.

3. Determine the expression for the impulse response $h[n]$ of the digital system of Fig.1 in terms of the impulse responses of the individual systems.

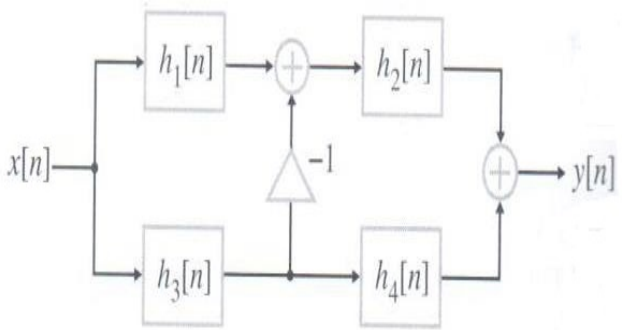

Figure 1: Diagram for Q3 and Q5

4. Develop the difference equation representation of the causal LTI digital system of Fig.2.

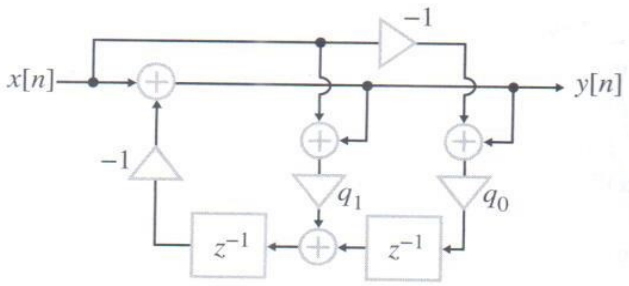

Figure 2: Diagram for Q4

5. Develop an equivalent representation of Fig.1 by applying the transpose operation and show that the impulse responses of both structures is the same.