|  |  |  |  |
| --- | --- | --- | --- |
| **Course Name:** | **Networks, Signals and Systems** | **Semester:** | **III** |
| **Date of Performance:** | **03 / 09 / 2023** | **Batch No:** | **A3** |
| **Faculty Name:** |  | **Roll No:** | **16014022050** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **\_\_\_ / 25** |

**Experiment No: 6**

**Title: Study of Continuous Time and Discrete Time signal**

|  |
| --- |
| **Aim and Objective of the Experiment:** |
| Generation and operation on signals with case study on real life application –   * Continuous signal * Discrete signal |

|  |
| --- |
| **COs to be achieved:** |
| **CO4**: Understand operations of continuous signals and systems. |

|  |
| --- |
| **Theory:** |
| **Continuous-Time vs. Discrete-Time –**  As the names suggest, this classiﬁcation is determined by whether or not the time axis (x-axis) is discrete (countable) or continuous. A continuous-time signal will contain a value for all real numbers along the time axis. In contrast to this, a discrete-time signal is often created by using the sampling theorem to sample a continuous signal, so it will only have values at equally spaced intervals along the time axis.  **Continuous-Time Signals –**  This signal will have some value at every instant of time. The electrical signals derived in proportion with the physical quantities such as temperature, pressure, sound etc. are generally continuous signals. Other examples of continuous signals are sine wave, cosine wave, triangular wave etc.    **Discrete-Time Signals –**  Discrete-time signals are functions deﬁned on the integers; they are sequences. Discrete-time signals are represented mathematically as sequences of numbers. A sequence of numbers x, in which the nth number in the sequence is denoted x[n],  formally written as |

|  |
| --- |
| **Stepwise-Procedure:** |
| **A) Continuous time signal –**   1. **Obtain the continuous signal from the application from the case study selected by the student** 2. **Perform the following operations on the selected signal:** 3. **Amplitude scaling** 4. **Time scaling** 5. **Folding** 6. **Time shifting**   clear all;  close all;  clc;  % Creating the time vector  t = 0:0.01:1;  % Defining the original signal  x = sin(2\*pi\*4\*t);  % Amplitude scaling  amp\_scale = 2;  x\_amp\_scaled = amp\_scale \* x;  % Time scaling  time\_scale = 2;  t\_scaled = time\_scale \* t;  x\_time\_scaled = sin(2\*pi\*4\*t\_scaled);  % Folding  t\_folded = -t;  x\_folded = sin(2\*pi\*4\*t\_folded);  % Time shifting  t\_shifted = t + 0.5;  x\_shifted = sin(2\*pi\*4\*t\_shifted);  % Plotting the results  subplot(2,3,1);  plot(t,x);  xlabel('Time');  ylabel('Amplitude');  title('Original Continuous Signal (ketaki)');  subplot(2,3,2);  plot(t,x\_amp\_scaled);  xlabel('Time');  ylabel('Amplitude');  title('Amplitude Scaled Signal (ketaki)');  subplot(2,3,3);  plot(t\_scaled,x\_time\_scaled);  xlabel('Time');  ylabel('Amplitude');  title('Time Scaled Signal (ketaki)');  subplot(2,3,4);  plot(t,x\_folded);  xlabel('Time');  ylabel('Amplitude');  title('Folded Signal (ketaki)');  subplot(2,3,5);  plot(t,x\_shifted);  xlabel('Time');  ylabel('Amplitude');  title('Time Shifted Signal (ketaki)');   1. **Obtain simulation result of step 2** 2. **Upload the results in the experiment document**   **B) Discrete time signal –**   1. **Obtain the Discrete signal from the application from the case study selected by the student** 2. **Perform the following operations on the selected signal:** 3. **Amplitude scaling** 4. **Time scaling** 5. **Folding** 6. **Time shifting**   clear all;  close all;  clc;  % Creating the discrete time vector  n = 0:10;  % Defining the original discrete signal  x = sin(0.2\*pi\*n);  % Amplitude scaling  amp\_scale = 2;  x\_amp\_scaled = amp\_scale \* x;  % Time scaling  time\_scale = 2;  n\_scaled = time\_scale \* n;  x\_time\_scaled = sin(0.2\*pi\*n\_scaled);  % Folding  n\_folded = -fliplr(n); % Flip the signal values  x\_folded = sin(0.2\*pi\*(-n\_folded)); % Adjusted folding operation  % Time shifting  n\_shifted = n + 2;  x\_shifted = sin(0.2\*pi\*n\_shifted);  % Plotting the results  subplot(2,3,1);  stem(n, x, 'filled', 'LineWidth', 2);  xlabel('Time');  ylabel('Amplitude');  title('Original Discrete Signal (ketaki)');  subplot(2,3,2);  stem(n, x\_amp\_scaled, 'filled', 'LineWidth', 2);  xlabel('Time');  ylabel('Amplitude');  title('Amplitude Scaled Discrete Signal (ketaki)');  subplot(2,3,3);  stem(n\_scaled, x\_time\_scaled, 'filled', 'LineWidth', 2);  xlabel('Time');  ylabel('Amplitude');  title('Time Scaled Discrete Signal (ketaki)');  subplot(2,3,4);  stem(n\_folded, x\_folded, 'filled', 'LineWidth', 2);  xlabel('Time');  ylabel('Amplitude');  title('Folded Discrete Signal (ketaki)');  subplot(2,3,5);  stem(n\_shifted, x\_shifted, 'filled', 'LineWidth', 2);  xlabel('Time');  ylabel('Amplitude');  title('Time Shifted Discrete Signal (ketaki)');   1. **Obtain simulation result of step 2** 2. **Upload the results in the experiment document** |

|  |
| --- |
| **Observations for Continuous time signal:** |
| **Original Continuous Signal –** |
| **Amplitude Scaling –** |
| **Time Scaling –** |
| **Folding –** |
| **Time Shifting –** |

|  |
| --- |
| **Observations for Discrete time signal:** |
| **Original Discrete Signal –** |
| **Amplitude Scaling –** |
| **Time Scaling –** |
| **Folding –** |
| **Time Shifting –** |

|  |
| --- |
| **Post Lab Subjective/Objective type Questions:** |
| 1. **Generate any continuous signals perform the operations on it, which are performed in the and upload the hand written solution.**        1. **Generate any discrete signals and perform the operations on it, which are performed in the and upload the hand written solution.** |

|  |
| --- |
| **Conclusion:** |
| In conclusion, the experiment successfully demonstrated the generation and operation of both continuous and discrete signals, providing practical insights into their real-life applications. The operations performed on these signals, such as scaling, shifting, and folding, have highlighted their versatility and importance in various fields. |

|  |
| --- |
| **Signature of faculty in-charge with Date:** |