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**AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF COMPUTER ENGINEERING**

**DATA COMMUNICATION LABORATORY**

**Fall 2023-2024, Section: I**

**Group: 4**

**LAB PERFORMANCE**

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**Submitted By:**

**Date of Submission**: **December 20, 2023**

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| **Code**  % Define frequency ranges for voice channels (assuming they are the same)  freq\_range\_1 = [30e3, 60e3]; % Frequency range for first set  freq\_range\_2 = [70e3, 100e3]; % Frequency range for second set  freq\_range\_3 = [110e3, 140e3]; % Frequency range for third set  % Sample rate for ADC  sample\_rate = 1e6; % Choose an appropriate sample rate  % Time duration and time vector  duration = 1; % Duration in seconds  t = linspace(0, duration, sample\_rate \* duration);  % Generate sinusoidal signals for each voice channel - First set  signal\_1 = sin(2\*pi\*(freq\_range\_1(1) + (freq\_range\_1(2)-freq\_range\_1(1))\*rand(1))\*t); % First set signal  signal\_2 = sin(2\*pi\*(freq\_range\_2(1) + (freq\_range\_2(2)-freq\_range\_2(1))\*rand(1))\*t); % Second set signal  signal\_3 = sin(2\*pi\*(freq\_range\_3(1) + (freq\_range\_3(2)-freq\_range\_3(1))\*rand(1))\*t); % Third set signal  % Multiplexing the first set using FDM  multiplexed\_signal\_1 = signal\_1 + signal\_2 + signal\_3; % FDM for first set  % Apply ADC (Analog-to-Digital Conversion) to convert to digital signal  bits = 8; % Define the number of bits for quantization  quantized\_signal\_1 = round((2^bits - 1) \* (multiplexed\_signal\_1 / max(abs(multiplexed\_signal\_1)))); % Quantize the signal  % Plot digital signal - First Set  figure;  subplot(2, 1, 1);  stem(quantized\_signal\_1);  title('Digital Signal - First Set');  xlabel('Sample');  ylabel('Quantized Value');  % Generating sinusoidal signals for the second set  signal\_4 = sin(2\*pi\*(freq\_range\_1(1) + (freq\_range\_1(2)-freq\_range\_1(1))\*rand(1))\*t); % Fourth set signal  signal\_5 = sin(2\*pi\*(freq\_range\_2(1) + (freq\_range\_2(2)-freq\_range\_2(1))\*rand(1))\*t); % Fifth set signal  signal\_6 = sin(2\*pi\*(freq\_range\_3(1) + (freq\_range\_3(2)-freq\_range\_3(1))\*rand(1))\*t); % Sixth set signal  % Multiplexing the second set using FDM  multiplexed\_signal\_2 = signal\_4 + signal\_5 + signal\_6; % FDM for second set  % Apply ADC (Analog-to-Digital Conversion) to convert the second set to digital signal  quantized\_signal\_2 = round((2^bits - 1) \* (multiplexed\_signal\_2 / max(abs(multiplexed\_signal\_2)))); % Quantize the signal  % Plot digital signal - Second Set  subplot(2, 1, 2);  stem(quantized\_signal\_2);  title('Digital Signal - Second Set');  xlabel('Sample');  ylabel('Quantized Value');  % Multiplexing the digital signals using TDM  tdm\_signal = [quantized\_signal\_1; quantized\_signal\_2]; % Combine the digital signals using TDM  c\_tdm\_signal = reshape(tdm\_signal.', 1, []);  % Plotting the TDM signal  figure;  stem(c\_tdm\_signal);  title('Combined TDM Signal');  xlabel('Sample');  ylabel('Quantized Value'); |

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**Figure:** output of the problem statement.