# DIGITAL COMMUNICATION LAB

**Electrical Engineering Department**

## Experiment 1: Sampling and Reconstruction

**AIM: Verification of Sampling Theorem and Reconstruction**

**Components Required:**

- Breadboard
- Digital Storage Oscilloscope (DSO)
- Function Generator
- BJT: 548/547
- Resistors: 39kΩ, 1kΩ
- Capacitor: 0.1$\mu$F
- Wires and Probes

**Theory**

Sampling in digital communication is converting a continuous-time signal into a discrete-time signal.

Sampling theorem states that a continuous-time signal can be perfectly reconstructed from its samples if the sampling rate is greater than twice the highest frequency component of the signal. Mathematically,

$Fs \geq 2fm$,

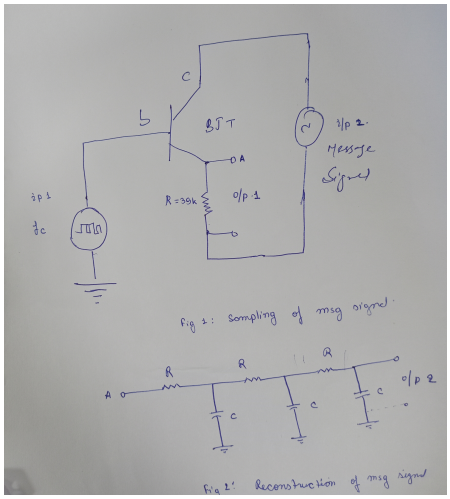


Figure 1: Circuit Diagram

where Fs is the sampling frequency and Fm is the message frequency.

**PROCEDURE:**

1. Make the connections as per the circuit diagram.
2. Take the sine wave and carrier wave (square wave) as inputs from the function generator.
3. Fix the frequency, amplitude, and offset voltage for the input signals.
4. Observe the sampled output signal on the DSO and note down the frequency.
5. Observe the sampled signal and note down the amplitude and time period of the signal.
6. Use the sampled signal as an input to a low-pass filter and obtain the reconstructed waveform.
7. Verify that the frequency of the reconstructed signal matches the frequency of the message signal.

| Parameters | Input 1 | Input 2 | Output 1 | Output 2 |
|---|---|---|---|---|
| **Frequency** | | | | |
| **Time Period** | | | | |
| **Amplitude** | | | | |

**Conclusion**: Verified the sampling theorem and reconstructed the original signal.