UNIVERSITY OF ENGINEERING AND TECHNOLOGY, TAXILA

Course: Wireless Communication Lab

Lab Manual No 05

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Lab Instructor: Engr. Usman Rauf

Topic: Analysis and implementation of TDMA

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Introduction:

- **Time Division Multiple Access (TDMA)** is a multiplexing technique where multiple users share a single communication channel but transmit in separate time slots.
- It is widely used in GSM networks, satellite communication, and digital telephony systems to efficiently manage bandwidth.

Practical Applications:

- Used in cellular networks (GSM), satellite communication, and digital voice systems.

Simulink Model Components & Their Functions:

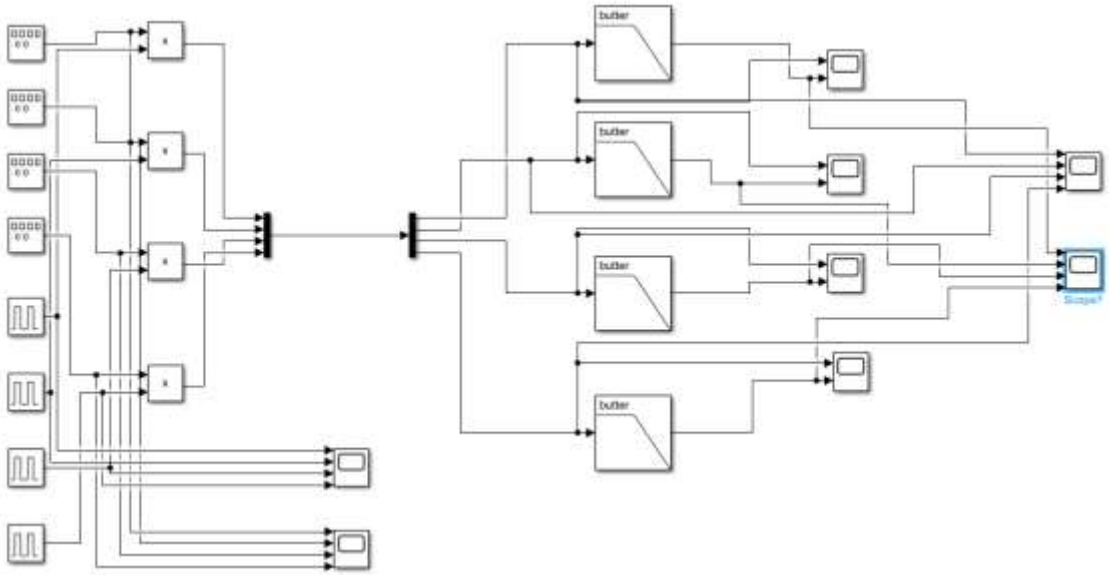
Component	Block Type	Function in TDMA Model
User Signal Sources	Constant / Signal Generator / Pulse Generator	Generates input signals for multiple users.
Multipliers (× Blocks)	Product Block	Allocates time slots by multiplying user signals with control pulses.
Time Slot Control	Pulse Generator	Generates periodic pulses to control when each user transmits.
Multiplexer (Mux)	Mux Block	Combines all user signals into a single transmission stream.
Transmission Channel	Direct Connection (Wire)	Simulates the medium through which the TDMA signal is transmitted.
Butterworth Filters	Digital Filter	Extracts and recovers individual user signals from the multiplexed signal.
Scope Blocks	Scope	Visualizes signals at different stages: input, multiplexed, and recovered signals.

Working Principle:

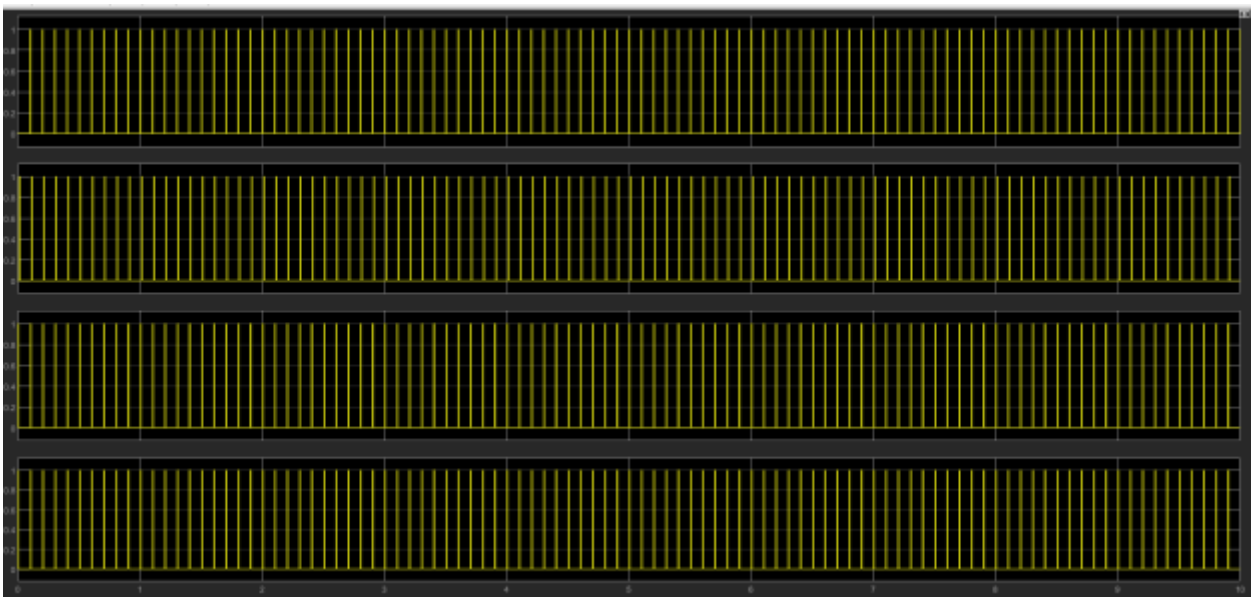
1. **User Signal Generation**: Different users generate signals using constant or pulse generators.
2. **Time Slot Allocation**: Each user signal is multiplied by a control pulse to allocate a unique time slot.

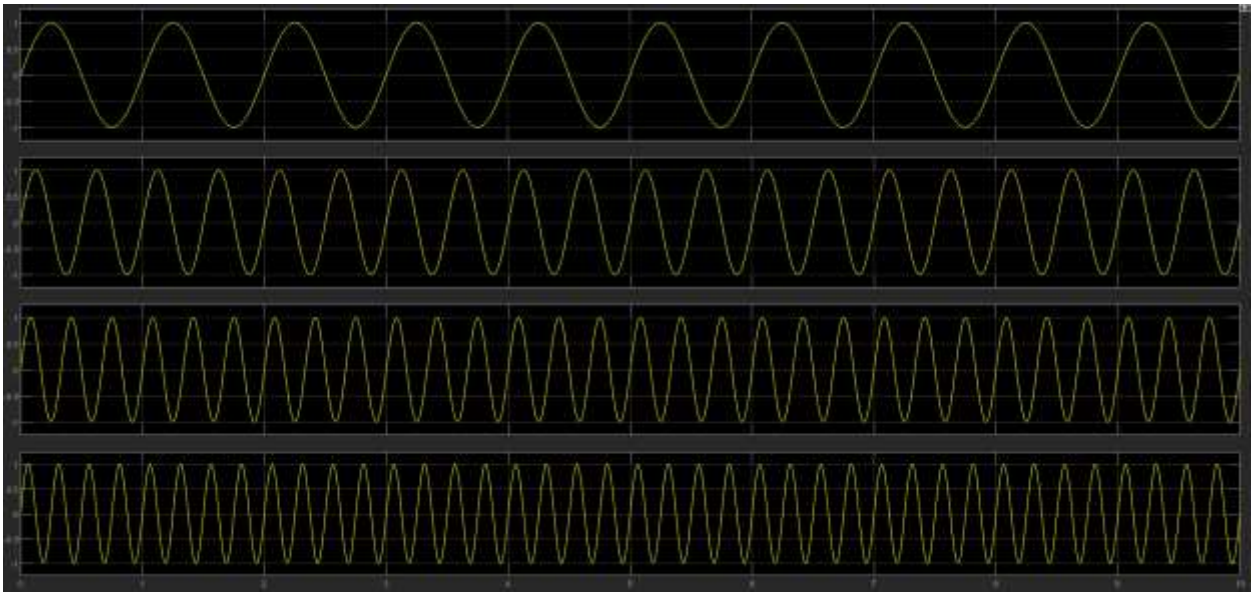
3. **Multiplexing**: The time-allocated signals are combined using a multiplexer, forming a TDMA transmission stream.
4. **Signal Recovery**: At the receiver, Butterworth filters extract individual signals by isolating their respective time slots.
5. **Visualization**: Scopes display signals at different stages—before transmission, after multiplexing, and after recovery.

Simulation Model:

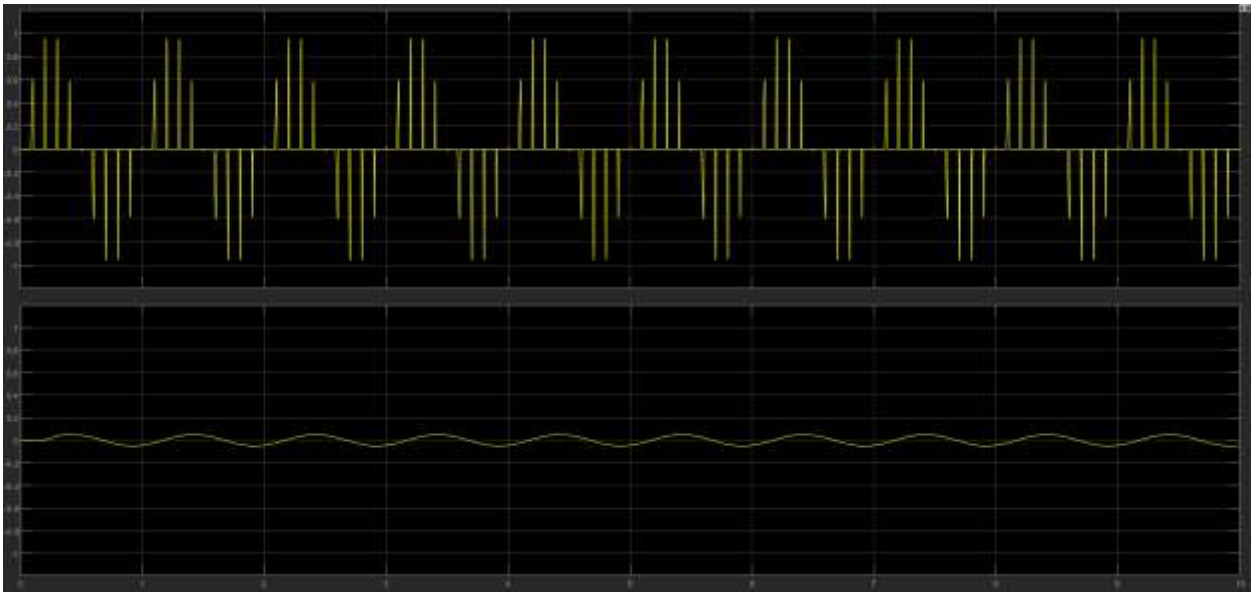


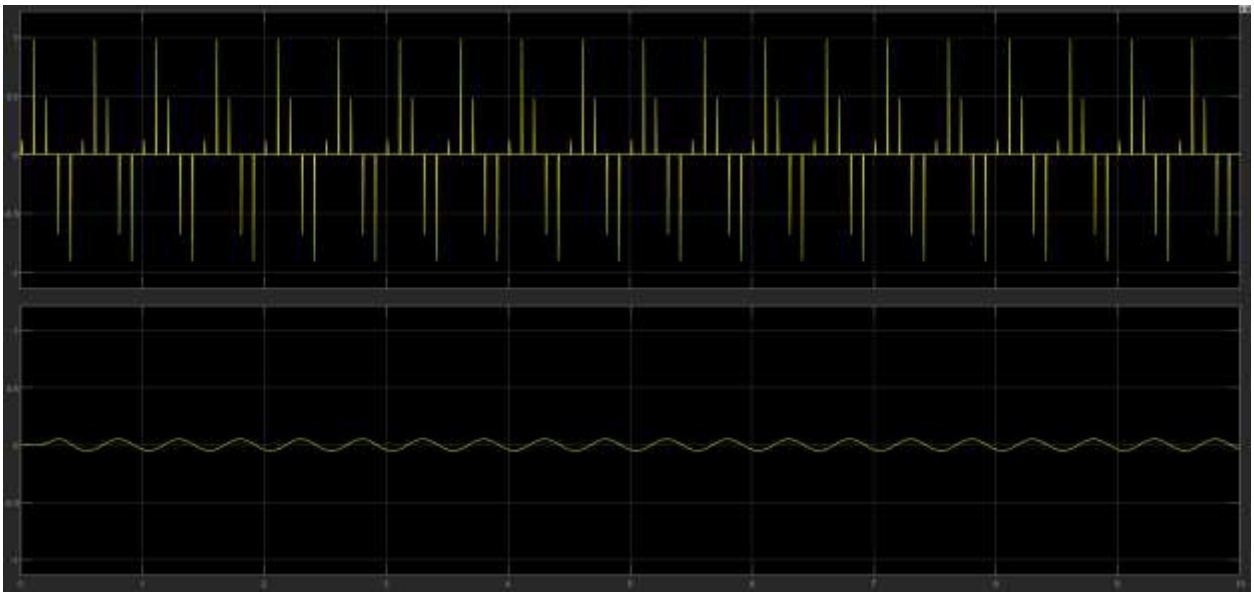
Signals before Multiplexing:

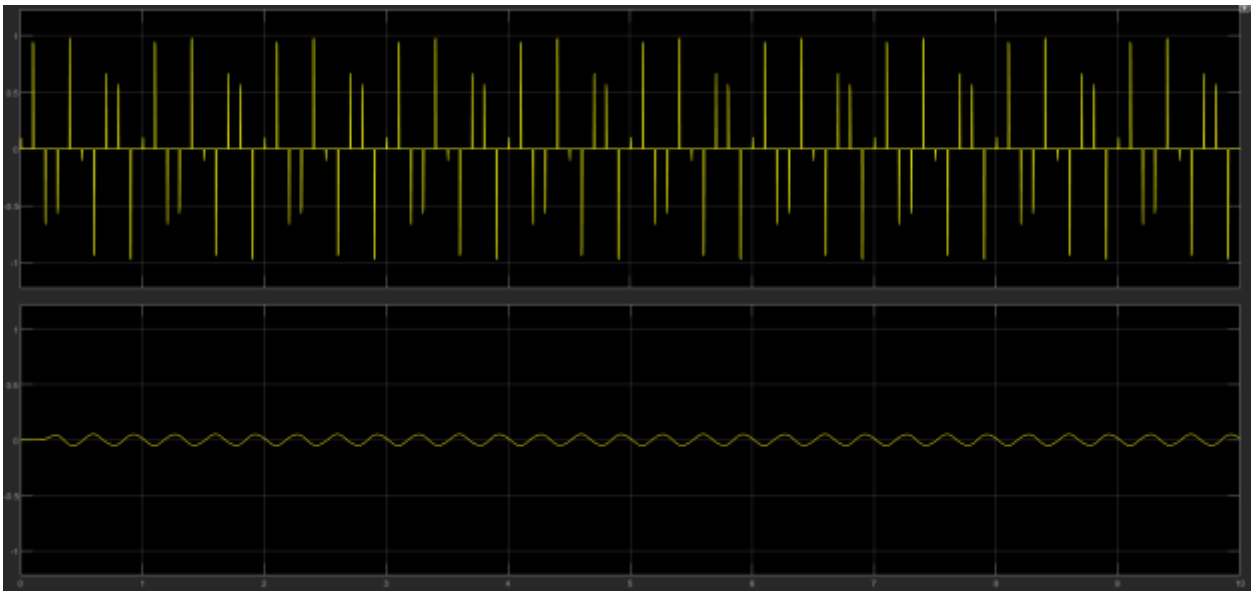


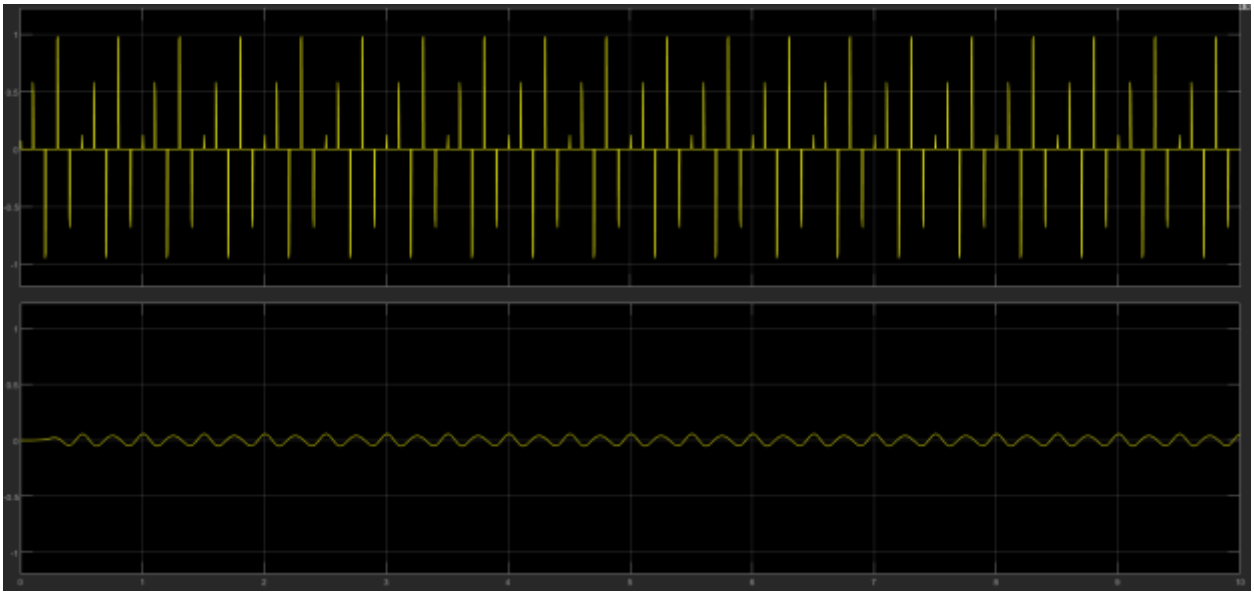


Filtered Signals:









Final Output: