Faculty of Engineering and Technology
Electrical and Computer Engineering Department
Communication Laboratory
ENEE4113

Prelab Exp6 : Pulse Amplitude Modulation (Sampling)

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Section: 6

Date: Nov 2, 2023

Software Prelab

Part 1: Generate a pulse train in Time and Frequency

- Block Diagram: → using the pulse generator

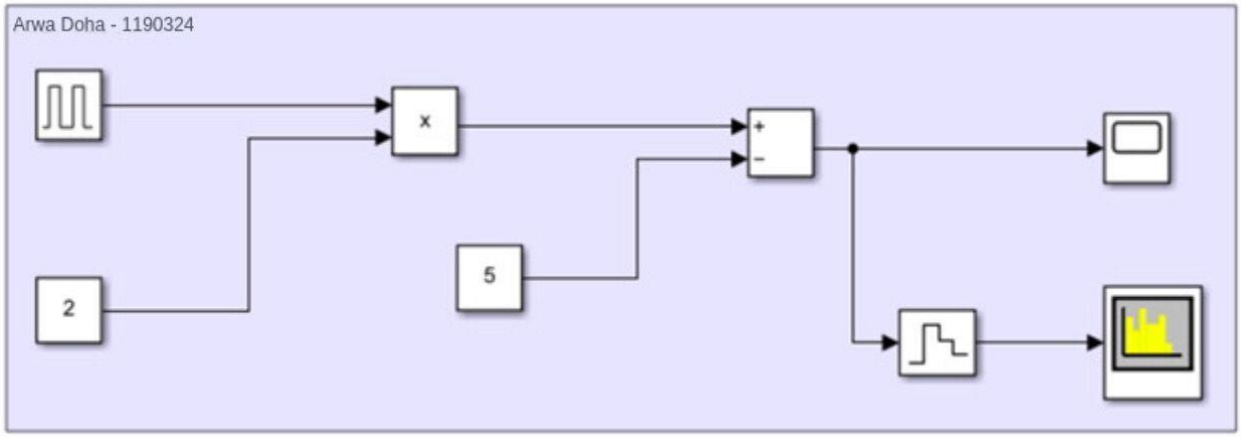

Fig1: Block diagram of Generate a pulse train

- In time Doman:-

- We have discrete rectangular pulses.

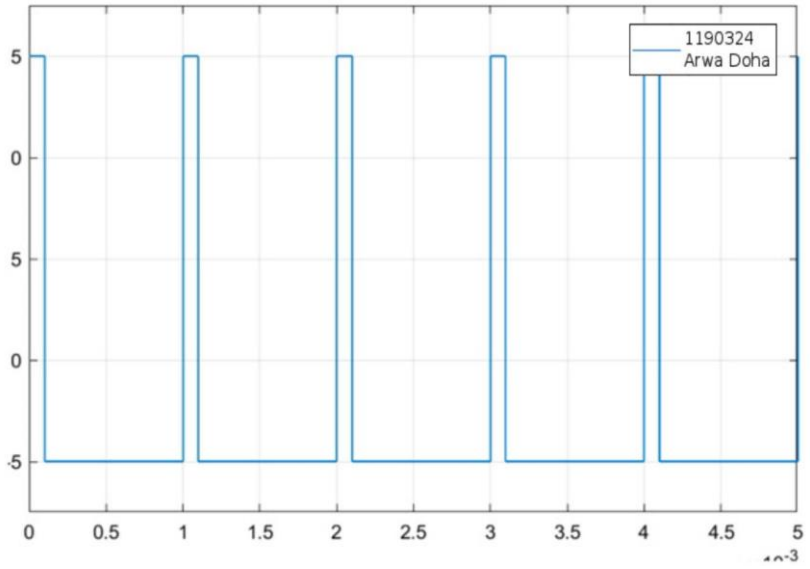

Fig2: Time-Domain Representation of Pulse Train

- In Freq-Domain:

- We have series of impulse functions, and 1 kHz from impulse to another.

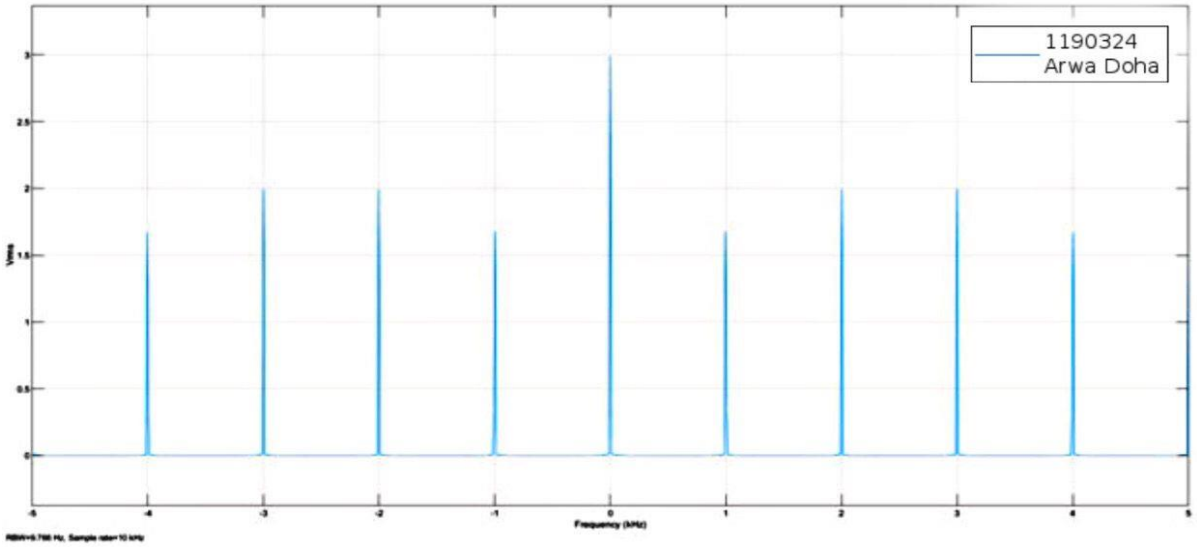

Fig3: Freq-Domain Representation of Pulse Train

➔ RBW= 9.766 , Sample rate =10KHz

Part 2: Natural Sampling (PAM1) with demodulation

2.1 In this part we have characteristics of Pulse Amplitude Modulation.

- Block Diagram:

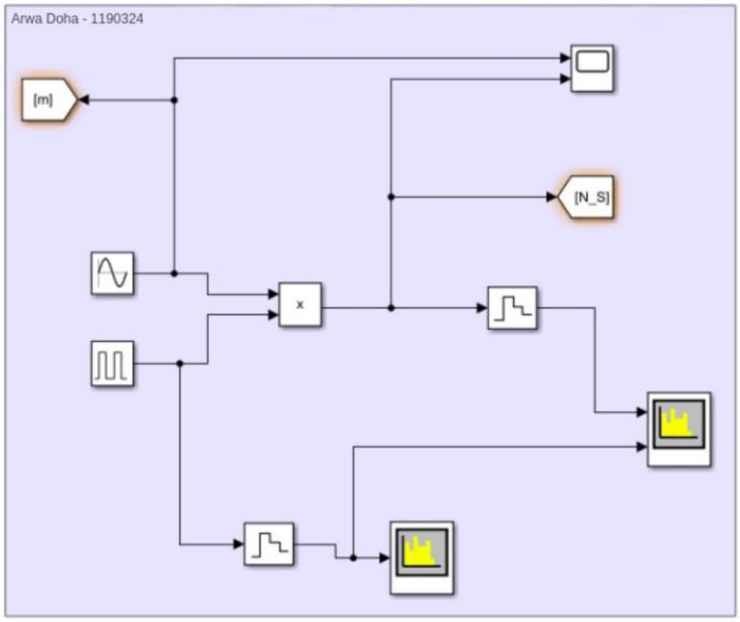

Fig4: Block diagram of PAM1

- In Freq-Domain:

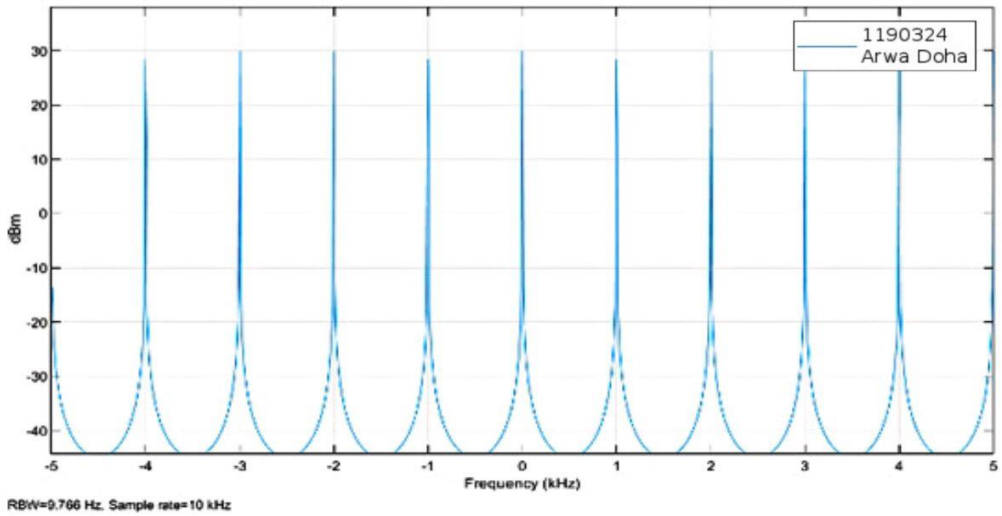

Fig5: Freq-Domain of PAM1

- In time Doman:-
  - Message signal and the sampled signal with duty cycle at 50

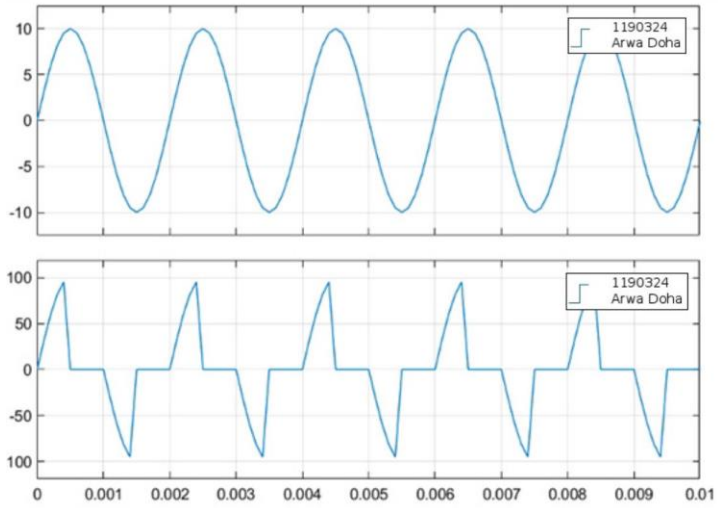

Fig6: Time-Domain of message signal and the sampled signal with 50 duty cycle

  - Message signal and the sampled signal with duty cycle at 10

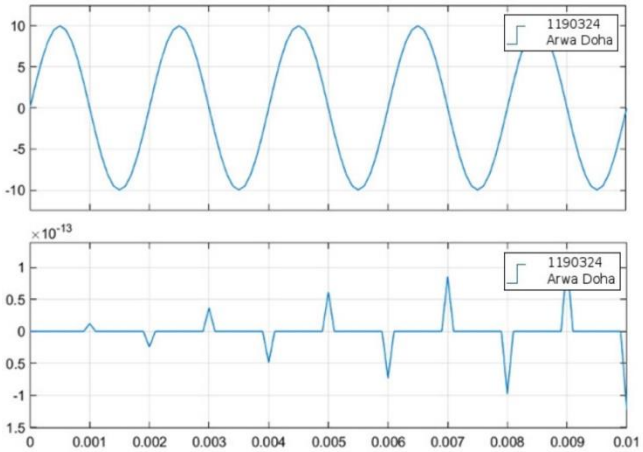

Fig7: Time-Domain of message signal and the sampled signal with 10 duty cycle

2.2 Demodulation of Natural Sampling

- Block Diagram:

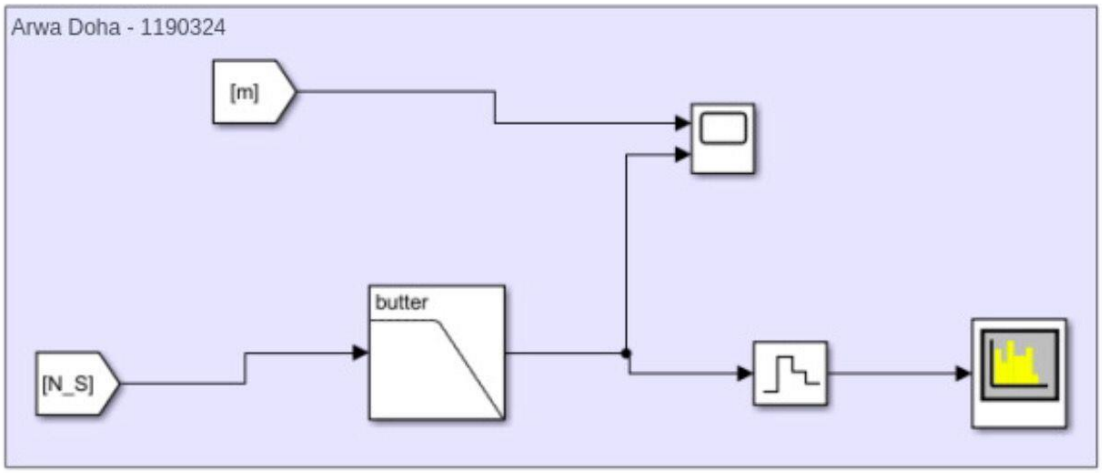

Fig8: Block diagram of Demodulation of Natural Sampling

- In time Doman:-

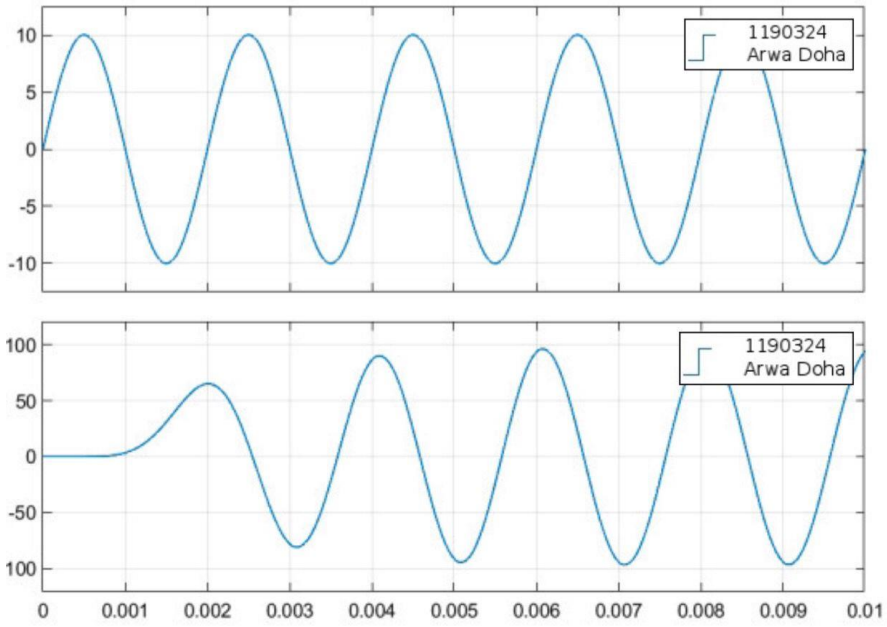

Fig9: Demodulated Signal in Time Domain using Natural Sampling

- In Freq-Domain:

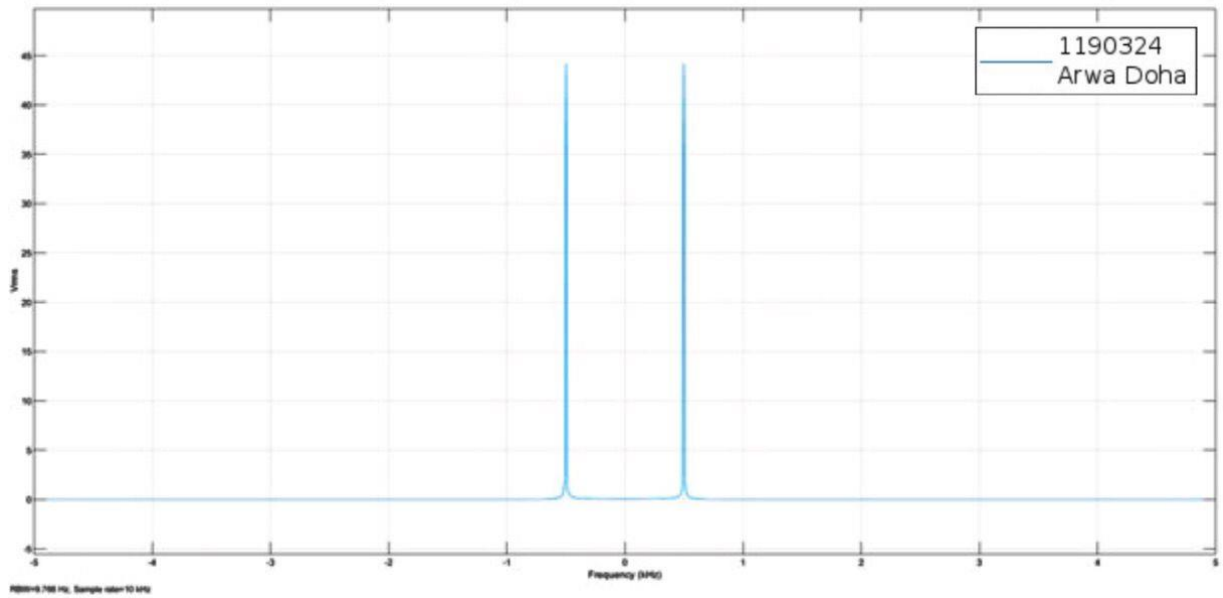

Fig10: Freq-Domain Demodulated Signal using Natural Sampling

Through the process of demodulation, we successfully recovered the original message signal operating at a frequency of 500Hz. By employing a low-pass filter , and as we note the frequency domain of demodulated signal in fig10 we note that dem-signal have the same freq of massage-signal.

Part 3: Flat-top(Hold) Sampling (PAM2) with demodulation

- Block Diagram:

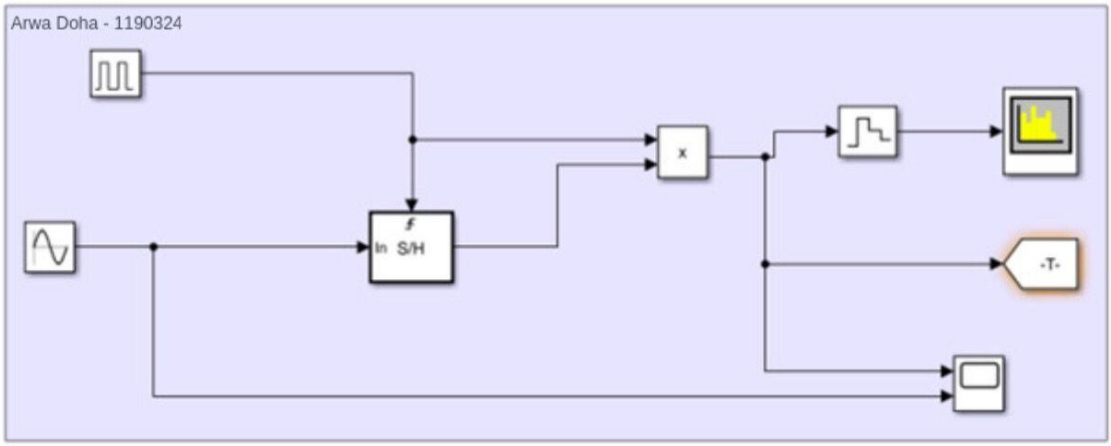

Fig11: Block diagram of Flat-top Sampling (PAM2) with demodulation

3.1 PAM2 with 10% duty cycle

- In time Doman:-

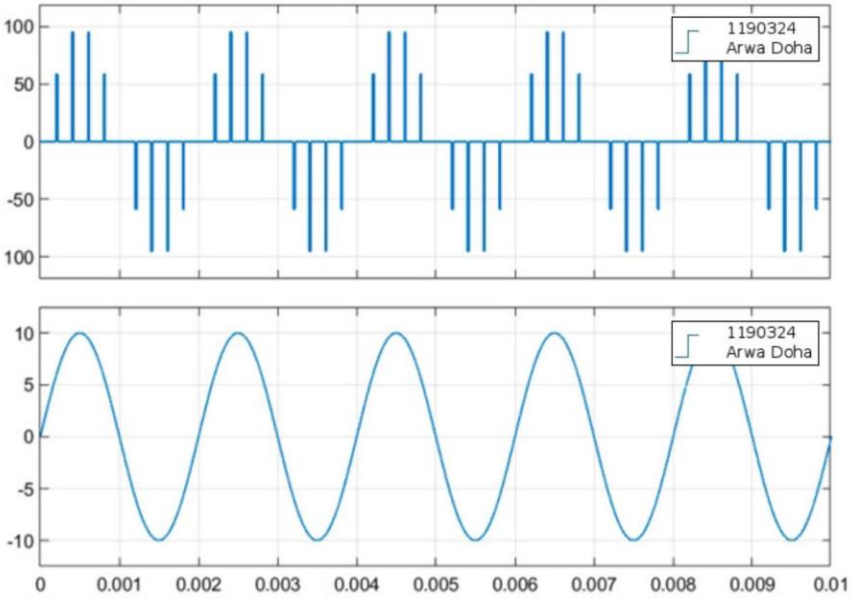

Fig12: Sample and Hold Sampling in Time-Domain with 10% duty cycle

- In Freq-Domain:

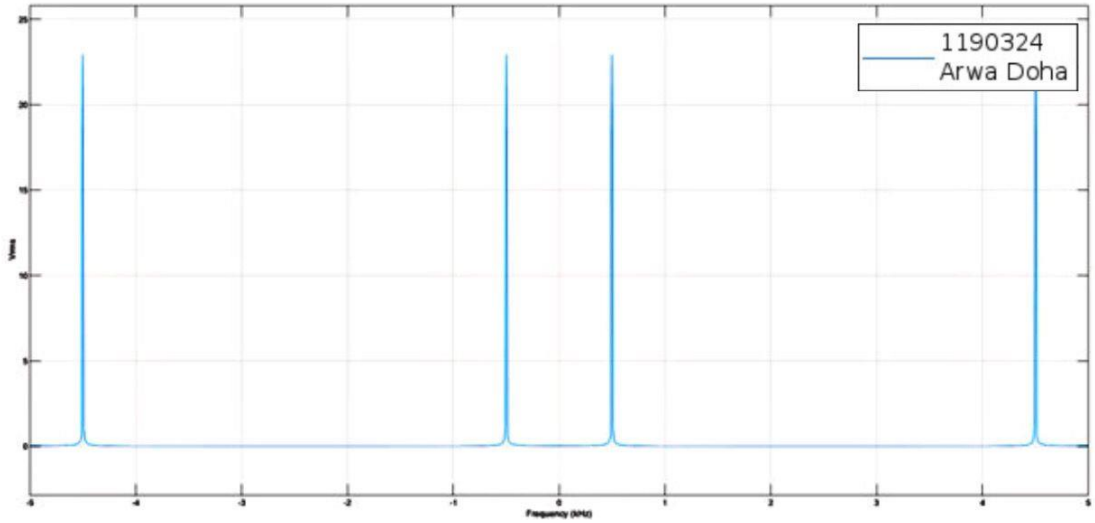

Fig13: Freq-Domain with 10% duty cycle

3.2 PAM2 with 30% duty cycle

- In time Doman:-

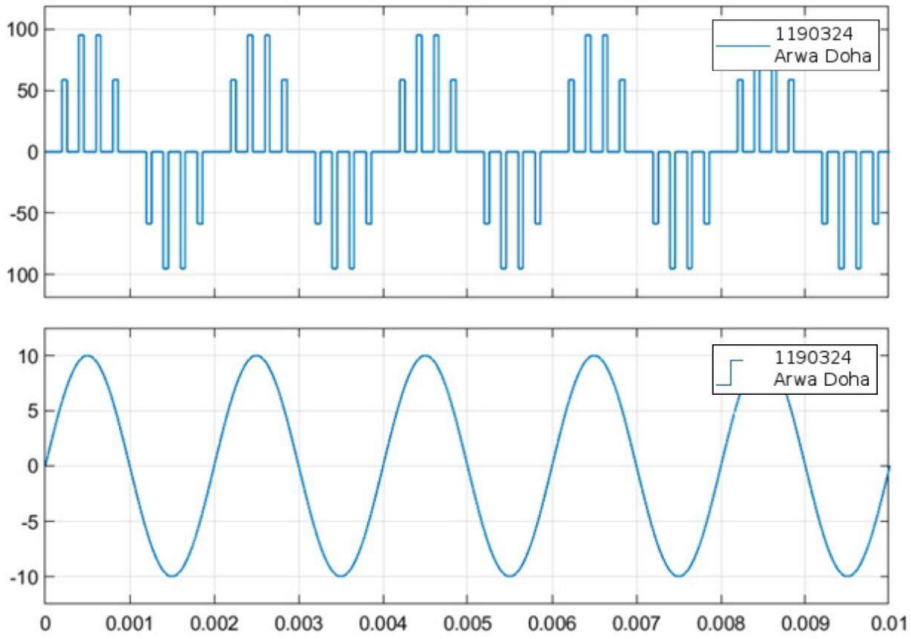

Fig14: Sample and Hold Sampling in Time-Domain with 30% duty cycle

- In Freq-Domain:

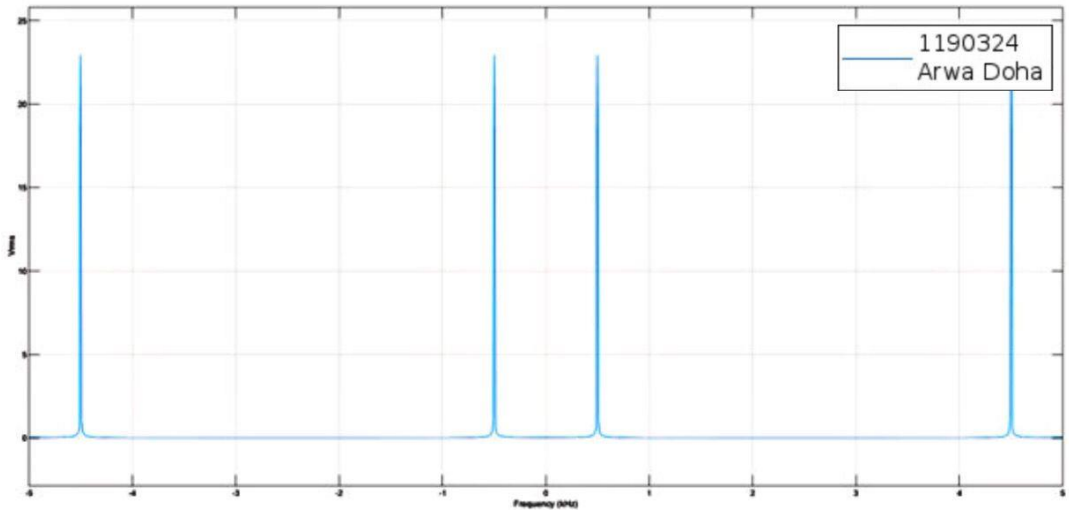

Fig15: Freq-Domain with 30% duty cycle

Part 4: Demodulation Natural Sampling

- Block Diagram:

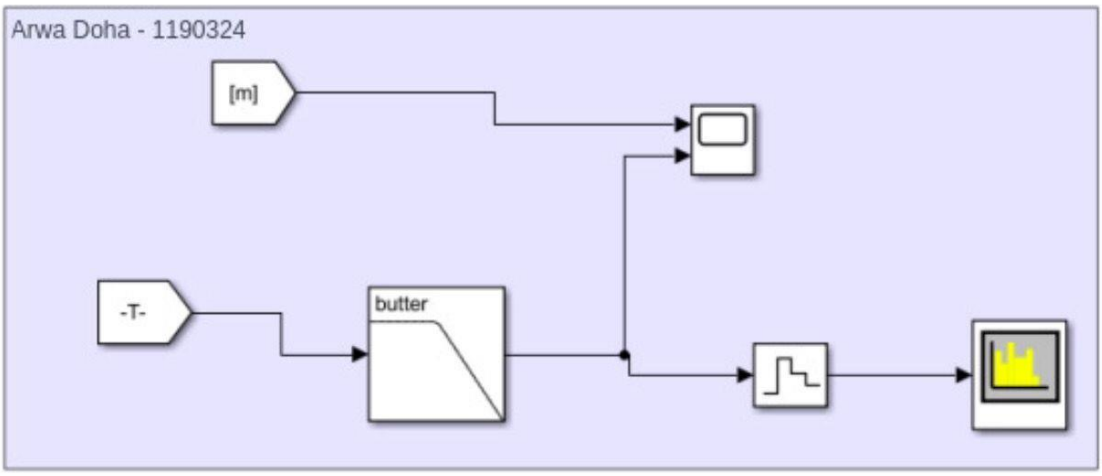

Fig16: Block diagram of demodulation Natural Sampling

- In time Doman:-

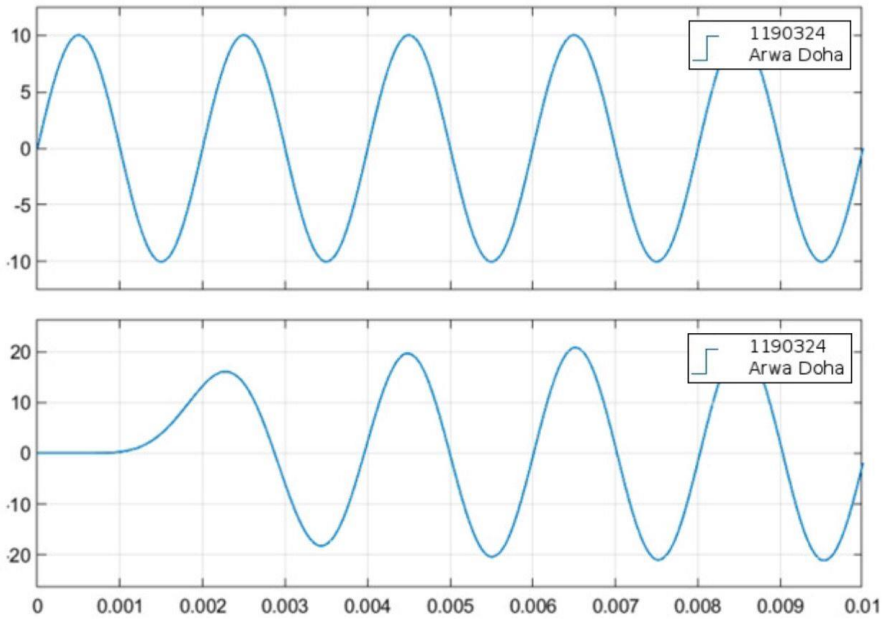

Fig17: Time-Domain demodulation Natural Sampling

- In Freq-Domain:

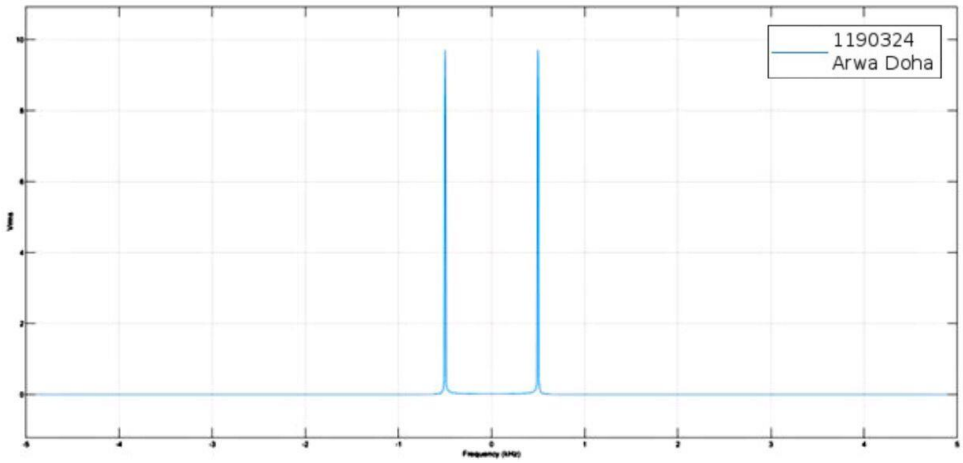

Fig18: Freq-Domain demodulation Natural Sampling

Much like the earlier demodulation process, employing a low-pass filter once again enables the successful retrieval of the message signal. In this instance, observing the frequency domain reveals the presence of two impulse functions at [500Hz & -500Hz], affirming the effectiveness of our demodulation process. This dual impulse pattern validates the accuracy → success of our demodulated output.