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| **Course Name:** | **Analogue Digital Systems** | **Semester:** | **IV** |
| **Date of Performance:** | **12 / 04 / 2024** | **Batch no.:** | **A - 2** |
| **Faculty Name:** | **Prof. Amrita Naiksatam** | **Roll no.:** | **16014022050** |
| **Faculty Sign & Date:** |  | **Grade / Marks:** | **\_\_\_ / 25** |

**Experiment No.: 9**

**Title: To generate and study Digital Modulation technique Binary Phase Shift Keying (BPSK) using LABVIEW/HARDWARE**

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| **Aim and Objective of the Experiment:** |
| * To understand the working of BPSK. * To visualize the BPSK output and make appropriate conclusions. |

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| **COs to be achieved:** |
| CO5: Understand and analyze various digital modulation and demodulation technique. |

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| **Theory:** |
| The BPSK involves the phase change of the carrier sine wave between angles 00 to 180 degrees in accordance with the data steam to be transmitted. The Binary Phase Shift Keying can also be known as Phase Reversal Keying (PRK). The functionality of the BPSK modulator is very similar to the BASK modulator. Both use the balanced modulator to multiply the carrier with modulating signal. But in contrast to BASK, the digital signal applied as modulating signal to BPSK is bipolar. When the modulating I/P is positive then O/P of the modulator is the sine wave which is in phase with the carrier where as for the negative voltage levels the O/P of the modulator is out of phase with the carrier I/P.  The unipolar to bipolar data converter converts the data bit stream to bipolar stream. At the receiver the square loop detector circuit is used to demodulate the transmitted BPSK signal. The PLL block locks to the frequency of the signal square O/P and produces a clean square wave O/P of the same Frequency. To derive the square wave O/P of the same frequency as the incoming BPSK signal, the PLL ‘s O/P is divided by two in frequency domain using the divided by two circuit. From the differential bit decoder O/P is a data ‘1’ when it encounters a level change and a ‘0’ when no change occurs. Thus, the O/P from differential bit decoder is NRZ (L) wave. |

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| **Step-Wise Procedure:** |
| 1. Carrier input (TP26 & TP17). 2. The NRZ output (TP6) to (TP20) 3. Unipolar converter output (TP21) to MOD1 input (TP27). 4. The modulated PSK output is available on pin (TP28). 5. MOD1 output (TP28) to PSK demodulator (TP10). |

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| **Circuit Diagram:** |
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| **Observation Table:** |
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| **Post Lab Subjective / Objective type Questions:** |
| 1. **What modulation scheme is used for high-speed telephone modem and why?**   High-speed telephone modems commonly use Quadrature Amplitude Modulation (QAM) for modulation. QAM allows for high data rates by simultaneously modulating both the amplitude and phase of the carrier signal. This enables a higher number of bits to be encoded per symbol compared to simpler modulation schemes like BPSK or BASK. QAM offers better spectral efficiency, allowing more data to be transmitted within the available bandwidth, which is crucial for high-speed communication over telephone lines.   1. **Why BPSK is preferred over BASK and BFSK?**   Frequency Shift Keying) for several reasons:   * Improved Noise Performance: BPSK is less susceptible to noise compared to BASK and BFSK. In BPSK, information is encoded in the phase of the carrier signal rather than its amplitude (BASK) or frequency (BFSK), making it more robust in noisy environments. * Bandwidth Efficiency: BPSK typically requires less bandwidth compared to BASK and BFSK for the same data rate. This is because BPSK encodes information by shifting the phase of the carrier signal, while BASK and BFSK modulate amplitude and frequency, respectively, which may require wider bandwidth. * Simplicity of Detection: BPSK demodulation is often simpler and more straightforward compared to BASK and BFSK. BPSK demodulation involves detecting the phase shift of the carrier signal, which can be done using simple phase detectors or coherent demodulation techniques. On the other hand, demodulating BASK and BFSK may require more complex circuitry. |

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| **Conclusion:** |
| The experiment enabled us to generate and examine Binary Phase Shift Keying (BPSK) modulation. By understanding BPSK's operation and visualizing its output, we gained valuable insights into digital modulation techniques, enhancing our comprehension of communication systems and their real-world applications. |

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