# Round 1

# Experiment Design for Communication Systems Laboratory

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**Department**: ECE

**Discipline**: ECE

**Name of the Lab**: Communication Systems Laboratory (C.S.L)

**Name of experiment**: Binary Frequency Shift Keying (BFSK)

**Focus Area**: Experimental Analysis Method

**About the experiment:**

Binary FSK is the most common form of FSK. With binary FSK, the center or carrier frequency is shifted by the binary input signal. Consequently, the output from an FSK modulator is a step function in the frequency domain. As the binary input signal changes from a logic 0 to logic 1 and vice versa, the FSK output signal shifts between two frequencies; a mark or logic 1 frequency and a space or logic 0 frequency. Users can see the binary input and the varying output frequency through the GUI. It is a constant-envelope form of angle modulation similar to conventional frequency modulation except that the modulating signal varies between two discrete voltage levels (i.e., 1’s and 0’s) rather than with a continuously changing value, such as a sine wave.

**1. Learning Objectives and Cognitive Level:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Learning Objectives** | **Cognitive level** | **Action Verb** |
| 1 | *Students will be able to* define the concept of Binary frequency shift keying among various digital modulation schemes. | Remember | Define |
| 2 | *Students will be able to* define the Pseudo random binary sequence as message data. | Remember | Define |
| 3 | *Students will be able to* calculate the frequencies of the carrier wave based on the selected binary data. | Apply | Calculate |
| 4 | *Students will be able to* analyze the outputs of each block. | Analyse | Analyse |
| 5 | *Students will be able to* analyse the characteristics of BFSK signal at the modulator and the corresponding retrieval of message at the demodulator. | Analyse | Analyse |
| 6 | *Students will be able to* evaluate the BFSK signal upon the computation of BER. | Evaluate | Evaluate |

2. **Instructional Strategy**:

**2. 1 Instructional Strategy**: Expository

**2.2 Assessment Method**: Formative Assessment

**2.3 Description of section:**

• Detailed theory is provided by considering all the aspects which develops intuition and deeper understanding of concepts, also reference will be provided for further information.

• In order to understand the process followed in simulation a complete set of procedure will be provided which helps the students to perform simulation.

• Step by step procedure which is carried out in lab manually is being simulated which gives exposure to real laboratory apparatus, empowering independent learning.

• Pre-quiz and post-quiz will be provided to test the understanding of the students before and after performing the experiments.

• Assignment questions will be provided to the students to make them explore more on the experiments.

• Once the students go through the virtual lab experiments, they can perform those experiments in real lab effectively.

3. **Task & Assessment Questions**

| Sr.No | Instructions given by the Teacher | Tasks to be done by the students | Assessment questions aligned to the task |
| --- | --- | --- | --- |
| 1. | State the concept of Binary frequency shift keying among various digital modulation schemes. | Click on the theory and procedure icons to view the concept of Binary frequency shift keying among various digital modulation schemes. | Q1 |
| 2. | Define Pseudo Random binary sequence for generating message data. | Click on the Pseudo random Binary sequence (PRBS) generator block to generate random binary digital input signal. | Q6 |
| 3. | Calculate the frequencies of the carrier wave based on the selected binary data. | Click on the frequency icon to select the frequencies of carrier signal. | Q2 |
| 4. | Explain the output signal of each block for better understanding of BFSK. | Click on the respective output blocks to see the waveforms. | Q4 |
| 5. | Explain the characteristics of BFSK signal at the modulator and the corresponding retrieval of message at the demodulator. | Click on the check Points (C.P) buttons to view the output waveform at that point. You can also check and compare multiple outputs by pressing all the C.P buttons one by one | Q3 |
| 6. | Explain the effects BFSK signal upon the computation of BER. | Click on the output icon of BFSK signal and evaluate the output. The Calculation of the Bit error rate is to be done. | Q5 |

**Additional Assessment Questions:**

**Q1. Is the definition of Binary Frequency shift Keying true?**

“Binary frequency shift keying (FSK) shifts the carrier frequency to one of two discrete frequencies during the bit time *T b* for the representation of binary logic signals for the transmission of information”

1. **True**
2. False

**Q2. In BFSK, no synchronous carrier is needed at the receiver.**

1. True
2. **False**

**Q3. In Binary FSK, mark and space respectively represent**  
  
 a) **1 and 0** b) 0 and 1  
 c) 11 and 00  
 d) 00 and 11

## Q4. For generation of FSK the data pattern will be

1. RZ pattern
2. **NRZ pattern**
3. Split-phase Manchester
4. None

**Q5. The maximum bandwidth is occupied by**  
  
a) ASK  
b) BPSK  
c) **BFSK**d) None of the above

**Q6. What type of message signal is used for modulation?**

1. Analog
2. **Digital**

4. **Simulator Interactions:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **What students will do?** | **What Simulator will do?** | **Purpose of the task** |
| 1 | Click on the theory and procedure given in the home page to carry out the BFSK modulation and demodulation experiment. | Show the theory and procedure to be followed to simulate the experiment. | Identify the functionality and objectives of the experiment. |
| 2 | Understand the blocks and generate the pseudo random sequence for message signal. | Display the pseudo random sequence for message signal. | To realize the type of message signal. |
| 3. | Open the workspace and choose the carrier frequencies. | Display the carrier signal. | To enter the correct values of carrier signal to get the desired output. |
| 4. | Click on the blocks and drag to the workspace to complete the connection of block diagrams. | Display the complete illustration of BFSK modulation in the workspace .Display the block diagram along with its connections. Display the output signal of the binary data sequence. | To ensure the correctness of connectivity of blocks. |