# MP3 Tag Reader and Editor - Interview Preparation Document

## Project Overview

## Objective

The MP3 Tag Reader and Editor is a command-line tool designed to read and modify ID3 tags in MP3 files. ID3 tags store metadata such as title, artist, album, year, genre, and comments, which help in organizing and managing music collections efficiently.

## Key Features

1. Read MP3 Metadata - Extract and display ID3 tag information.  
2. Edit MP3 Metadata - Modify specific fields like title, artist, album, year, genre, and comments.  
3. ID3v2 Tag Support - Ensures compatibility with standard MP3 metadata formats.  
4. Command-Line Interface (CLI) - Simple and efficient usage through terminal commands.  
5. Error Handling & Validation - Ensures only valid MP3 files are processed.

## Technology Stack

- Programming Language: C  
- Concepts Used:  
 - File Handling (Reading & Writing MP3 tags)  
 - Bitwise Operations  
 - Command-Line Argument Parsing  
 - Structs and Enums for Data Management

## How It Works

1. Viewing MP3 Metadata:  
  
Command:  
```bash  
./a.out -v sample.mp3  
```  
Output Example:  
```bash  
TITLE : Song Name  
ARTIST : Artist Name  
ALBUM : Album Name  
YEAR : 2021  
MUSIC : Genre  
COMMENT : Sample Comment  
```  
  
2. Editing MP3 Metadata:  
  
Command:  
```bash  
./a.out -e -y 2023 sample.mp3  
```  
Output:  
```bash  
YEAR: 2023  
YEAR CHANGED SUCCESSFULLY  
```

## Potential Interview Questions & Answers

## Technical Questions

## 1. What is an ID3 tag, and why is it used in MP3 files?

ID3 tags are metadata containers in MP3 files that store information like title, artist, album, and year. They help in organizing and categorizing audio files.

## 2. How does the program read and modify MP3 metadata?

The program opens the MP3 file, checks for the ID3 header, reads specific frames (e.g., TIT2 for title), and modifies them using file operations.

## 3. Explain how file operations work in C.

File operations in C use functions like fopen(), fread(), fwrite(), and fclose() to manipulate files. The program reads, modifies, and writes metadata using these functions.

## 4. What is the role of bitwise operations in handling metadata?

Bitwise operations are used to convert data between big-endian and little-endian formats, ensuring compatibility with ID3 tag structures.

## 5. How do you ensure file integrity after modifying the metadata?

The program creates a temporary copy of the file, applies changes, verifies modifications, and then replaces the original file only if the changes are successful.

## 6. What is the difference between ID3v1 and ID3v2 tags?

ID3v1 is a fixed 128-byte tag at the end of an MP3 file with limited fields, while ID3v2 is more flexible, supporting variable-length frames and extended metadata.

## 7. Explain command-line argument parsing in C.

The program uses argc and argv to interpret user inputs, identifying options like -v for viewing and -e for editing metadata.

## 8. How do you handle error checking and validation in this project?

The program verifies file format, checks for valid metadata, ensures correct input arguments, and handles errors using return codes and messages.

## Future Enhancements

- Add GUI support for easier user interaction.  
- Support batch processing of multiple MP3 files.  
- Implement ID3v1 tag support for backward compatibility.  
- Integrate with music streaming services for metadata updates.

## Conclusion

This project demonstrates file handling, data manipulation, and system-level programming in C. It showcases expertise in command-line tools, error handling, and real-world applications of C programming.