1. You are working on a project to control an LED matrix. The design requires sending values from 00 to FF to port P1 for testing different light patterns. Write an 8051 C program to send the values from 00 – FF to port P1 continuously. Discuss how this program could be used to verify the functionality of the LED matrix.
2. A digital display system is to be designed to display ASCII characters for digits 0-5 and letters A-D on a 7-segment display connected to port P1. Write an 8051 C program to send the hexadecimal values for ASCII characters of 0, 1, 2, 3, 4, 5, A, B, C, and D to port P1. Explain how this program ensures accurate data transmission to the display.
3. You are tasked with creating a signal generator for toggling a group of LEDs connected to port P1. Write an 8051 C program to toggle all the bits of P1 continuously. How can this program be modified to control the speed of the LED toggling?
4. In an experiment involving signed numbers, you need to send values from -4 to +4 to a DAC connected to port P1. Write an 8051 C program to send these values to port P1. How would you handle the signed numbers in this program?
5. A microcontroller-based switch debouncing system requires toggling bit D0 of port P1 exactly 50,000 times to test its reliability. Write an 8051 C program to toggle bit D0 of port P1 (P1.0) 50,000 times. Discuss how timing accuracy can affect the system’s performance.
6. You are developing a system where precise time delays are critical. Write an 8051 C program to toggle the bits of port P1 continuously with some delay. Discuss two different approaches to generate delays and the factors associated with each approach.
7. For a system requiring 250 ms delay between consecutive LED toggles, write an 8051 C program to toggle all bits of port P1 continuously with a 250 ms delay. Explain the steps taken to achieve an accurate 250 ms delay.
8. In a communication interface system, you need to capture a byte of data from port P1, wait for ½ second, and then send it to another peripheral connected to port P2. Write an 8051 C program to achieve this functionality. How does the delay impact data transmission in this case?
9. An 8051-based system needs to decide between two peripherals based on a value comparison. Write an 8051 C program to get a byte of data from port P0. If it is less than 100, send it to P1; otherwise, send it to P2. Discuss the importance of efficient data comparison in this program.
10. In a sensor monitoring system, you need to monitor a specific bit of port P2 without affecting the rest of the port. Write an 8051 C program to toggle only bit P2.4 continuously without disturbing the rest of the bits of P2. Why is it important to maintain the state of the other bits?
11. Design a system to monitor an alarm signal connected to P1.5 and take appropriate action. Write an 8051 C program to monitor bit P1.5. If it is high, send 55H to P0; otherwise, send AAH to P2. How does this program ensure reliable response to the input signal?
12. A security system uses a door sensor connected to P1.1 and a buzzer connected to P1.7. Write an 8051 C program to monitor the door sensor, and when it opens, sound the buzzer by sending a square wave of a few hundred Hz. How does this program handle real-time door monitoring?
13. In an industrial control system, a relay needs to be switched on and off precisely 50,000 times to verify its endurance. Write an 8051 C program to turn bit P1.5 on and off 50,000 times. What are the key factors to consider while implementing this test?
14. You are designing a control system that requires continuous monitoring of a switch connected to P1.0. Write an 8051 C program to get the status of bit P1.0, save it, and send it to P2.7 continuously. How can this program be integrated into a larger control system?
15. Write an 8051 C program to toggle all the bits of P0 and P2 continuously with a 250 ms delay. Implement the toggling using the inverting operator for P0 and the Ex-OR operator for P2. Explain the difference in behavior between the two toggling methods.
16. For a data acquisition system, you need to invert an input bit before sending it to the output. Write an 8051 C program to get bit P1.0 and send it to P2.7 after inverting it. Why is bit manipulation important in microcontroller programming?
17. A user interface requires displaying different characters based on switch input. Write an 8051 C program to read the P1.0 and P1.1 bits and issue an ASCII character to P0 according to the following table:

| **P1.1** | **P1.0** | **Character** |
| --- | --- | --- |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 2 |
| 1 | 1 | 3 |

How can this be extended for larger input ranges?

1. Write an 8051 C program to convert packed BCD 0x29 to ASCII and display the bytes on P1 and P2. How is BCD to ASCII conversion useful in microcontroller applications?
2. Write an 8051 C program to convert ASCII digits ‘4’ and ‘7’ to packed BCD and display them on P1. How is ASCII to BCD conversion relevant in numeric data processing?
3. You are tasked with ensuring data integrity in a communication system. Write an 8051 C program to perform a checksum operation to verify the integrity of data. If the data is valid, send ASCII character 'G' to P0; otherwise, send 'B'. Discuss the significance of checksum operations.