1. MCQ

1. Which communication protocol is best suited for long-distance and high-noise environments?
    1. SPI
    2. UART
    3. I2C
    4. CAN
2. A microcontroller has an 8-bit timer with a clock of 10MHz and prescaler 0f 64. What is the maximum time delay that can be generated before overflow?
    1. 4.396ms
    2. 2.048ms
    3. 1.632ms
    4. 6.553ms
3. What is the resolution of a 10-bit ADC with a 5V reference?
    1. 5mV
    2. 10mV
    3. 4.88mV
    4. 1.22mV
4. What is the primary advantage of using Direct Memory Access (DMA) in a microcontroller?
    1. Decreases program size
    2. Slows down data transfer
    3. Increases power consumption
    4. Reduces CPU workload
5. In PWM-based timer control, what happens if the duty cycle is increased?
    1. The pulse width decreases
    2. The average output voltage increases
    3. The timer stops counting
    4. The output frequency increases
6. In a microcontroller timer, what is the function of the prescaler?
    1. To adjust the system clock frequency
    2. To divide the input clock frequency and slow down the timer
    3. To increase the timer’s resolution

4. To generate a PWM signal

7. In SPI communication, what happens if the MISO line is floating?
   Options:

   1. It always returns 0x00
   2. It always returns 0xFF
   3. The SPI master cannot send data
   4. It increases the clock frequency
8. In CAN protocol, what is the function of the arbitration process?
   Options:
   1. To check for errors in transmission
   2. To allow multiple devices to communicate without conflict
   3. To establish a clock signal
   4. To terminate unused connections
9. What is the primary function of an input capture unit in a microcontroller's timer module?
   Options:
   1. To generate PWM signals
   2. To measure the duration of an external pulse
   3. To count the number of external pulses
   4. To adjust the system clock speed
10. In an SPI communication, what happens if the clock polarity (CPOL) and clock phase (CPHA) settings of the master and slave do not match?
    1. The communication works normally
    2. Data corruption occurs due to incorrect sampling and shifting
    3. The SPI bus switches to I2C mode
    4. The clock signal is ignored by the slave

2. Basics

1. Types of memories in microcontrollers.

2. Can I increase the frequency of the microcontroller? If yes, how is it possible?
3. What is a servo motor?
4. Explain the clock of the microcontroller.
5. what is meant by bidirectional ports?
6. What is the difference between ROM and RAM?
7. How to change the brightness of the LED.
8. Explain CLCD.
9. What is the difference between embedded C and C?
10. How do you calculate the speed of the rotating disc using a microcontroller?
11. What is the interfacing component used between a potentiometer and a microcontroller?

3. Interrupts

1. How many oscillators are there in PIC18F?
2. Generate the delay for 1 sec using a loop.
3. Write a formula for a 1 ms delay.
4. Types of timers
5. What is clock stretching?
6. Difference between timer and counter.

4. Digital Circuits

5. Projects

6. ADC

1. Explain the block diagram of SAR.
2. Explain the types of temperature sensors.
3. Explain the accelerometer.
4. Difference between EEPROM and RAM
5. Explain ADC and list the types.
6. Why is the pull resistor used in I2C?
7. Explain EEPROM.
8. How many bits of ADC did you use, and how do you convert analog to digital?
9. What is the resolution of a register?

7. Communication protocols

1. Difference between SPI and UART protocols.

2. Explain the CAN data frame.
3. Explain the waveform of the I2C protocol.
4. Explain the CAN protocol and it's types.
5. Explain the SPI protocol.
6. What are the range and speed of the CAN, I2C, and UART protocols?
7. Difference between the RS232 and UART protocols.
8. Compare the SPI and I2C protocols.
9. Explain UART and draw the frame format.
10. Bus arbitration in the CAN protocol.
11. How can you know whether the data is transmitted or not in UART?
12. Explain baud rate.
13. Explain the SPI protocol with real-time examples.
14. What is the bit width in UART?
15. How actual transmission occurs in UART.
16. Why we need to transfer 2 stop bits in UART.
17. How do you communicate with an EEPROM using the I2C protocol?
18. What is the maximum distance data transfer for which we can use UART?
19. How much time does I2C take for 1 byte of data transfer?
20. What is the highest baud rate that we can use in UART? What happens if we use more than that?
21.

8. Basic Electronics [Filters, Rectifiers, etc.]

1. What are amplifiers?
2. What are oscillators?

9. Control Systems

10. Embedded Systems

11. Projects

1. Explain the pick-to-light project. How CAN is used in Pick 2 light. How arbitration works.
2. Explain the car black box project.

12. Programming

1. Write a program to generate a delay of 1 sec.
2. Write a pseudocode to read the analog value from a sensor and output as per below conditions and explain
    I. Blink a green LED if the analog value is in the range of 512 - 1023
    II. Blink a red LED if the analog value is in the range of 1024 - 2047
    III. Blink a red LED with a buzzer sound in the range of 2048 - 4095
    IV. Reset the process if a switch is pressed using ISR.

13. Architecture

1. Draw an architecture diagram and explain the features of any one microcontroller.
2. Block diagram of car black box.