**ASSIGNMENT-1**

**Issue Date: Submission Date:**

1. Define an embedded system and explain its key characteristics.
2. What is a microcontroller? How is it different from a microprocessor?
3. List some popular microcontrollers used in embedded systems.
4. Explain the role of the Central Processing Unit (CPU) in an embedded system.
5. Discuss the importance of memory in microcontroller-based systems.
6. Differentiate between volatile and non-volatile memory.
7. What is an interrupt? How are interrupts used in embedded systems?
8. Describe the concept of polling in the context of microcontroller-based systems.
9. Explain the purpose of timers and counters in embedded systems.
10. Discuss the role of Input/Output (I/O) devices in microcontroller-based systems.
11. What are the advantages and disadvantages of using interrupts over polling?
12. Compare and contrast the Harvard architecture and von Neumann architecture.
13. Define the terms Big-endian and Little-endian in the context of microcontrollers.
14. Explain the concept of watchdog timers and their significance in embedded systems.
15. Discuss the process of analog-to-digital conversion (ADC) in microcontrollers.
16. What is the purpose of a Real-Time Clock (RTC) in embedded systems?
17. Differentiate between synchronous and asynchronous communication protocols.
18. Explain the significance of serial communication protocols (UART, SPI, I2C) in microcontroller-based systems.
19. Discuss the concept of multiplexing and its application in microcontrollers.
20. Describe the process of pulse width modulation (PWM) and its uses in embedded systems.
21. What is a bootloader? How does it facilitate firmware updates in microcontrollers?
22. Discuss the concept of power management in embedded systems.
23. Explain the principles of low-power design in microcontroller-based systems.
24. Define the terms bit-banging and hardware-based communication in the context of microcontrollers.
25. Discuss the use of Real-Time Operating Systems (RTOS) in embedded systems.