

POKHARA ENGINEERING COLLEGE
Internal Assessment Examination

Level: Bachelor	Semester – Fall	Year : 2025
Programme: BCE		Full Marks: 100
Course: Embedded System		Pass Marks: 45
		Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the essential features that differentiate embedded systems from general-purpose computing systems. 8
- b) List and describe at least three key application domains of embedded systems. 7
2. a) Draw and explain the AVR microcontroller architecture with its key components 3+5
- b) Write a program to store and retrieve a value from the EEPROM memory of an AVR 7
3. a) What is an RTOS, and how does it benefit embedded system applications? 2+5
- b) Describe the conditions that can lead to deadlock in RTOS-based embedded systems. 8
4. a) What are the primary differences between structural and behavioral modeling styles in VHDL? Explain briefly with some simple examples. 2+5
- b) Write a VHDL code to implement a Multiplexer. 8
5. a) A company is designing a smart home automation system where various sensors (temperature, motion, gas, etc.) and actuators (lights, fans, door locks) communicate with a central hub. The system must support both wired and wireless communication for different devices. 4+5

Questions:

- i. Identify and justify suitable communication protocols (wired and wireless) for this system.
- ii. Compare SPI, I2C, and UART in terms of data rate, complexity, and

- b) power consumption for sensor communication.
- b) Difference between LoRa and Bluetooth. 6

6. a) What are the key layers of the TCP/IP model? Briefly describe their functions. 8
- b) Describe the working principle of the MQTT protocol and explain its key components 7
7. Write short notes on **any two**: 2×5
- a) Sensors and Actuators
- b) Timers and Counters in AVR
- c) GSM/GPRS