

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS44

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024

## Microcontroller and Embedded Systems

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain ARM core data flow model with neat diagram. (08 Marks)
- b. List and explain ARM processor modes. Also explain ARM core changing from user mode to interrupt request mode on an exception, with a neat diagram. (08 Marks)
- c. Differentiate: Microprocessor vs Microcontroller. (04 Marks)

OR

- 2 a. What is pipeline? Compare ARM7 three stage pipeline, ARM9 fire-stage pipeline and ARM10 six stage pipeline. (08 Marks)
- b. Explain exception of interrupt. Narrate interrupt vector table. (08 Marks)
- c. Write a short note on Hardware extensions for a ARM core. (04 Marks)

### Module-2

- 3 a. Explain single register load store addressing modes with examples. (08 Marks)
- b. Explain the program status register instructions. Also write a code fragment to.
  - i) Copy the cpsr into register r1
  - ii) Clear bit 7 of r1
  - iii) Copy the register r2 back to cpsr.(08 Marks)
- c. Explain the following ARM instructions with examples:
  - i) BIC ii) MRS iii) STMIB iv) SWP.(04 Marks)

OR

- 4 a. With neat diagram and example, explain block memory transfer in the memory map using load-store multiple instructions. (08 Marks)
- b. Explain stack operation of ARM processors. Also explain the load-store multiple addressing aliases available to support stack operations. (08 Marks)
- c. Explain software interrupt instruction with its syntax. (04 Marks)

### Module-3

- 5 a. Write a function in assembly that can sum any number of integers. The argument should be the number of integers to sum followed by a list of the integers. (08 Marks)
- b. What is an Embedded system? Explain the different classifications of embedded systems. Give example for each. (08 Marks)
- c. Write the difference between microprocessors and microcontrollers. (04 Marks)

OR

- 6 a. What is Programmable Logic Device (PLD)? What are the different types of PLDs? Explain advantages of PLDs in embedded system design. (08 Marks)
- b. What is 7-segment LED display? What are two different configurations of 7-segment LED display? Explain. (08 Marks)
- c. Differentiate sensors v/s actuators. (04 Marks)

**Module-4**

- 7 a. What is hardware software co-design? Explain the fundamental issues in hardware software co-design. (08 Marks)  
b. Explain the product life-cycle curve of an embedded product development. (08 Marks)  
c. What is the difference between compiler and cross compiler? (04 Marks)

**OR**

- 8 a. Explain different embedded firmware design approaches in detail. (08 Marks)  
b. Explain sequential program model. (08 Marks)  
c. Differentiate 'C' versus 'Embedded C'. (04 Marks)

**Module-5**

- 9 a. What is Kernel? What are the different functions handled by Kernel for a general purpose OS? (08 Marks)  
b. What is Task Control Block (TCB)? Explain structure of TCB. (08 Marks)  
c. Differentiate between thread and process. (04 Marks)

**OR**

- 10 a. Explain different techniques available for embedding firmware into the target board for a non-os based embedded system. (08 Marks)  
b. Explain structure of a process and explain process life cycle with various activities involved in the creation of process. (08 Marks)  
c. Write a note on Remote Procedure Call (RPC) mechanism for IPC. (04 Marks)

\*\*\*\*\*