

# CBCS SCHEME

## Sixth Semester B.E. Degree Examination, Feb./Mar.2022 ARM Microcontroller & Embedded Systems

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Write a neat diagram of architecture of ARM Cortex-M3 processor and explain each block in brief. (09 Marks)
- b. Explain the operation modes of cortex M3 processor with diagram. (04 Marks)
- c. Briefly explain the reset sequence of Cortex-M3 processor. (03 Marks)

OR

- 2 a. Explain general purpose and special registers of Cortex M<sub>3</sub> Processors. (08 Marks)
- b. Indicating the need, explain PUSH and POP operations with an example for each. (04 Marks)
- c. Write the debugging support features of cortex M<sub>3</sub> processor. (04 Marks)

### Module-2

- 3 a. Briefly explain the following instructions of Cortex M<sub>3</sub> processor:  
(i) ADDS R<sub>0</sub>, R<sub>0</sub>, R<sub>1</sub>      (ii) PUSH {R<sub>4</sub> - R<sub>6</sub>, LR}  
(iii) CBNZ R<sub>0</sub>, label (06 Marks)
- b. Write a C program to toggle (blink) an LED connected to P<sub>0.4</sub> pin of cortex-M<sub>3</sub> processor. Use suitable delay. (05 Marks)
- c. Write and explain memory mapping of cortex M<sub>3</sub> processor. (05 Marks)

OR

- 4 a. What is CMSIS? Discuss the CMSIS core structure. (10 Marks)
- b. Briefly explain following instructions of cortex M<sub>3</sub> processor with an example,  
(i) MSR and MRS      (ii) BFC and BFI      (iii) SXTB and UXTB (06 Marks)

### Module-3

- 5 a. Explain classification of embedded systems. (05 Marks)
- b. Briefly explain the core of an embedded system. (05 Marks)
- c. Discuss optocoupler and relay in brief. (06 Marks)

OR

- 6 a. What are programmable logic devices? Compare CPLD and FPGA's. List the advantages of PLD over fixed logic devices. (06 Marks)
- b. List different on board communication interfaces and explain any one. (06 Marks)
- c. Write a note on embedded firmware. (04 Marks)

### Module-4

- 7 a. What is operational quality attribute? Explain operational quality attributes to be considered in embedded system design. (06 Marks)
- b. Explain two basic approaches used in embedded firmware design. (06 Marks)
- c. Mention the advantages and drawbacks of assembly language based development. (04 Marks)

OR

- 8 a. Explain the different characteristics of embedded systems in detail. (07 Marks)
- b. Design a coin operated public telephone unit based on FSM model for following requirements:
- Calling process is initiated by lifting the receiver.
  - After lifting user has to insert 1 rupee coin to make call
  - If line is busy coin is returned
  - If line is through he can talk till 60 seconds.
  - If user does not insert another 1 rupee coin call is terminated after 60 seconds (after 45<sup>th</sup> second prompt is initiated to insert coin)
  - System is ready to accept new call when receiver is placed in hook. (06 Marks)
  - System goes to 'out of order' when there is line fault. (03 Marks)
- c. What is hardware and software codesign? (03 Marks)

Module-5

- 9 a. What is a Kernel? Explain classifications of Kernel? (04 Marks)
- b. Three processes with process IDS P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> are having estimated completion time of 10, 5, 7 milliseconds respectively enters the ready queue together. Calculate the waiting time and turn around time for each process and the average waiting time and turn around time (assuming no I/O waiting for the processes) in SJF algorithm. (06 Marks)
- c. Explain the concept of deadlock with an example. Also explain the methods of handling deadlock.) (06 Marks)

OR

- 10 a. Define the terms:
- Process
  - Task
  - Thread
- b. Explain RTOS in brief. (06 Marks)
- c. Explain simulator based debugging and ICE based target debugging techniques. (04 Marks)
- (06 Marks)

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