USN ☐☐☐☐☐☐☐☐☐☐

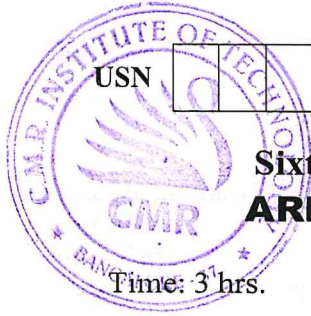**15EC62**

## Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
## ARM Microcontroller and Embedded Systems

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

1  a. Describe the functions of various units of the architecture of ARM Cortex M3 with neat block diagram. **(07 Marks)**
   b. Explain 3 special function registers of ARM Cortex M3. **(06 Marks)**
   c. State the applications of ARM Cortex M3. **(03 Marks)**

**OR**

2  a. Explain in detail the functions of registers $R_0 - R_{15}$ only of ARM Cortex M3. **(04 Marks)**
   b. Explain in detail the operating modes of ARM Cortex M3 with switching diagrams. **(06 Marks)**
   c. Describe the functions of exceptions with vector table ad priorities. **(06 Marks)**

### Module-2

3  a. Explain Briefly about the basic syntax and the use of suffixes in assembly language instructions of Cortex M3 processor. **(04 Marks)**
   b. Explain the following ARM Cortex M3 instructions with examples :
      i) RSB    ii) BIC    iii) ASR    iv) BFI    v) SBFX    vi) REVSH. **(12 Marks)**

**OR**

4  a. Construct and explain in detail the predefined memory map of Cortex M3. **(12 Marks)**
   b. Write an ALP to find the sum of first 10 integer numbers $1 + 2 + 3 + - - - - + 10$. **(04 Marks)**

### Module-3

5  a. Compare embedded system and general purpose computing system. **(04 Marks)**
   b. Explain the components of a typical embedded system in detail. **(08 Marks)**
   c. Give the various application areas of embedded system. **(04 Marks)**

**OR**

6  a. Explain the different types of memories used in embedded system design. **(05 Marks)**
   b. Explain in detail the SP2 communication interface with sequence of operation for communicating with slave device. **(05 Marks)**
   c. Explain the role of reset circuit and watch dog timer in embedded system. **(06 Marks)**

### Module-4

7  a. Explain the characteristics of an embedded system. **(05 Marks)**
   b. What is operational quality attribute? Explain the important operational quality attributes to be considered in any embedded system design. **(08 Marks)**
   c. Explain the different communication buses used in automotive application. **(03 Marks)**

**OR**

8  a.  With FSM model, explain the design and operation of automatic seat belt warning system.
                                                                                                    **(05 Marks)**
   b.  Explain the different firmware design approaches in detail.                                   **(08 Marks)**
   c.  Bring out the advantages of high level language based firm ware development.                  **(03 Marks)**

## Module-5

9  a.  What is a kernel? Mention the functions of real time kernel.                                  **(04 Marks)**
   b.  What is pre-emptive scheduling? Three processes with process ID's P1, P2, P3 with
       estimated completion time 10, 5, 7 ms and priorities 1, 3, 2 (0- highest priority, 3 – lowest
       priority) respectively enters the ready queue together. A new process P4 with estimated
       completion time 6ms and priority 0 enters the ready queue after 5ms of start of execution of
       P1. Calculate the average waiting time and turnaround time.                                  **(07 Marks)**
   c.  Explain the transition of process with state transition diagram.                              **(05 Marks)**

**OR**

10 a.  Explain out of circuit and in system programming methods for integration of firmware with
       hardware.                                                                                     **(08 Marks)**
   b.  Explain simulator based debugging and ICE based target debugging techniques.                  **(08 Marks)**

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