# CBCS SCHEME

USN | | | | | | | | | |

**18EC753**

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
## ARM 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.  Illustrate on the major design rules of RISC philosophy. **(08 Marks)**
    b.  With block diagram, demonstrate your understanding on AMBA bus protocol in embedded system. **(08 Marks)**
    c.  Explain the functionality of interrupt controllers in embedded system. **(04 Marks)**

### OR

2   a.  With neat diagram of ARM core data flow model, explain the various functional units and the signal flow. **(10 Marks)**
    b.  Illustrate how the pipeline mechanism speeds up the execution process in RISC processors. **(05 Marks)**
    c.  Demonstrate the role of interrupt vector table in the execution of various subroutines. Draw IVT. **(05 Marks)**

### Module-2

3   a.  With one example for each, explain the various instructions available in ARM for arithmetic operations. **(10 Marks)**
    b.  With suitable syntax and addressing modes, demonstrate how the load store multiple instructions can transfer, multiple registers between memory and the processor in a single instruction. **(10 Marks)**

### OR

4   a.  Identify the instructions which are used to control the program status registers. With appropriate syntax and example line of code, explain the same. **(07 Marks)**
    b.  Write an ALP to perform the addition of 2 numbers stored in registers and also store the result in the register. Let one of the data be a left shifted by one. **(03 Marks)**
    c.  Describe how stack operations are performed using ARM instructions. Mention address modes and briefly explain them. With pre and post values, write the operation done by the following instructions:
    (i)   STMFD SP!, {$r_1$, $r_4$}
    (ii)  STMED SP! {$r_1$, $r_4$} **(10 Marks)**

### Module-3

5   a.  Write a Thumb code to find given 16 bit number is even or odd and count the number of bytes in it (code density). **(07 Marks)**
    b.  How do you link the ARM and Thumb Code together? Explain the process. **(06 Marks)**
    c.  How the single register transfer is done in ARM using thumb instruction set? **(07 Marks)**

**OR**

6  a. Which instruction causes software interrupts in thumb mode? How it is different from ARM equivalent instruction. **(05 Marks)**

   b. Write the differences between ARM code and Thumb code. Also illustrate on the registers used by thumb state. **(07 Marks)**

   c. Write an ALP to perform logical operations of DATA's (AND, OR, EXOR and NOT). Write the PRE and POST values of the register used. **(08 Marks)**

## Module-4

7  a. List and briefly describe the basic C data types for ARM compilers. **(04 Marks)**

   b. What is exception handling? Explain the mechanism which is adopted to handle the exceptions which occur simultaneously. Also indicate the reasons for these exceptions. **(08 Marks)**

   c. What is interrupt latency? How to minimize it? **(08 Marks)**

**OR**

8  a. Describe the issues which may be encountered when porting C code to the ARM. **(12 Marks)**

   b. With the general description, explain briefly the interrupt handling schemes. **(08 Marks)**

## Module-5

9  a. Summerize the common execution flow of firmware implementation. **(10 Marks)**

   b. Indicate the technologies included in the firmware package developed by ARM. Describe the features of it. **(10 Marks)**

**OR**

10 a. Describe the components of Embedded Operating System. **(10 Marks)**

   b. Draw the diagram to show the memory hierarchy and the significance of various memory components in the hierarchy. **(10 Marks)**

* * * * *