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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E.   **Semester: V**
Branch: MEDICAL ELECTRONICS ENGINEERING   **Duration: 3 hrs.**
Course Code: 19ML5PCESD   **Max Marks: 100**
Course: Embedded System Design with ARM   **Date: 21.02.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Compare a general computing system with embedded system. List advantages of embedded system.   **07**

b) Analyze the operation of a brown out detector in a real time system.   **05**

c) Illustrate the data communication between SPI master and a slave device. Mention the advantages of SPI over I2C.   **08**

OR

2 a) Enumerate and explain the purpose of embedded system. Give an example for each purpose considering a common application.   **07**

b) Explain the critical role played by Watchdog Timer in an embedded system   **06**

c) Illustrate the I2C protocol used for on board communication in embedded system using the simplified schematic and relevant timing diagrams.   **07**

UNIT - II

3 a) Explain operation modes and privilege levels in Cortex M3.   **08**

b) Briefly explain the function of internal registers and special function registers in Cortex M3.   **05**

c) What is the type of stack used in Cortex M3 architecture? Exemplify operation of PUSH and POP instructions used for data transfer.   **07**

UNIT - III

4 a) Exemplify operation of the following instructions
i. BIC   ii. TST   **06**

b) Draw and explain Cortex M3 predefined memory map of 4GB total memory.   **08**

c) Develop an embedded C code for the following operations   **06**
i. Assume port pin 1 .1 is to be used as input and all other pins of port1 as output.
ii. Now, make the port P1.1 as output but do not alter the status of other pins

5	a)	Exemplify operation of the following instructions i. UBFX ii. BFI	**06**
	b)	Write an assembly level and embedded C program to add two bytes.	**06**

	c)	Analyze the code snippet and identify addressing modes used in each line.
		 Assume R1=0x00000008 R5=0x00000001 R4=0x00000100
		      LDR R0, [R1, R5, LSL #2]
		      STRH R0, [R4], #4
		      LDRNE R2, [R4, #8]!
			08

UNIT - IV

6	a)	List and explain the non-operational quality attributes of embedded system.	**06**
	b)	If the source code is written in embedded C, how is ROM image obtained in an embedded system design? Discuss.	**07**
	c)	Design a coin operated public telephone unit based on FSM model for the following requirements.	**07**

    1. The calling process is initiated by lifting the receiver (off-hook) of the telephone unit. After lifting the phone the user needs to insert a 1 rupee coin to make the call. If the line is busy, the coin is returned on placing the receiver back on the hook (on-hook)

    2. If the line is through, the user is allowed to talk till 60 seconds and at the end of 45th second, prompt for inserting another 1 rupee coin for continuing the call is initiated

    3. If the user doesn't insert another 1 rupee coin, the call is terminated on completing the 60 seconds time slot.

    4. The system is ready to accept new call request when the receiver is placed back on the hook

      The system goes to the 'Out of Order' state when there is a line fault.

UNIT - V

7	a)	List and explain the services handled by the kernel.	**10**
	b)	List and explain any two preemptive scheduling methods.	**10**

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