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Course Code

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**Fourth Semester B.E. Degree Examinations, Sept/Oct 2023
MICROCONTROLLER AND EMBEDDED SYSTEMS**

(Common to CSE & AIML)

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<u>MODULE – 1</u>			
1.	a. Differentiate between RISC and CISC processors.	05	(1 :1: 1.3.1)
	b. What are the major design rules to be followed to implement the RISC philosophy	05	(1 :1: 1.3.1)
	c. Explain ARM core data flow model with neat diagram.	10	(2:1: 1.3.1)
OR			
2.	a. Differentiate between Microprocessor and Microcontrollers.	05	(1 :1: 1.3.1)
	b. What are the differences that make ARM instruction set different from pure RISC.	05	1 :1: 1.3.1)
	c. With the help of bit layout diagram explain current program status register of ARM.	10	(2 :1: 1.3.1)
<u>MODULE – 2</u>			
3.	a. Illustrate the arithmetic instructions of ARM processor with suitable example	10	(2 :2: 1.3.1)
	b. i) Illustrate single register addressing modes with the following example ii) Assume $r0 = 0x00000000$, $r1 = 0x00009000$, $mem32[0x00009000] = 0x01010101$, $mem32[0x00009004] = 0x02020202$. Find the value of $r0$ and $r1$ after executing the following instructions in isolation. i) LDR $r0, [r1, \#4]$ ii) LDR $r0, [r1, \#4]$ iii) LDR $r0, [r1], \#4$	10	(3 :2: 1.3.1)
OR			
4.	a. Apply the load & store instructions with respect to the Single Register Transfer	10	(2 :2: 1.3.1)
	b. i) Illustrate the ARM swap instruction with an example code. ii) If $mem32[0x000A0000] = 0x01010101$, $r1 = 0x00000000$, $r2 = 0x22222222$ $r0 = 0x000A0000$. Find $r1$, $r2$ and memory contents after executing the instruction swp r1, r2, [r0]	10	(3 :2: 1.3.1)
<u>MODULE – 3</u>			
5	a. Differentiate between i) Embedded systems and General-purpose computing systems. ii) Sensors and actuators	10	(1 :3: 1.3.1)
	b. Explain the different classifications of embedded systems. Give example for each	10	(2 :3: 1.3.1)

OR

- 6 a Describe the following onboard communication interfaces **10** (2 :3: 1.3.1)
i) I2C ii) SPI
- b What is Embedded Firmware? What are the different approaches available for Embedded Firmware development? Explain in brief. **10** (1:3: 1.3.1)

MODULE – 4

7. a. What is the operational and non-operational quality attributes of an embedded systems. **10** (1 :4: 1.3.1)
- b. Explain Automotive – Domain specific **embedded** system in detail **10** (2 :4: 1.3.1)

OR

8. a. Differentiate between **10** (1 :4: 1.3.1)
i) “C” versus ‘Embedded C’
ii) complier and cross-complier
- b. Summarise the different ways of Mixing Assembly and High-Level language. **10** (2 :4: 1.3.1)

MODULE – 5

9. a. What is Process Life Cycle? Explain various activities involved in the creation of process. **10** (2 :5: 1.3.1)
- b. What is deadlock? What are the different conditions favouring deadlock and also explain different methods of handling deadlocks **10** (2 :5: 1.3.1)

OR

10. a. Outline the different functional and non-functional requirements that needs to be evaluated in the selection of an RTOS **12** (2 :5: 1.3.1)
- b. Differentiate between **08** (2:5: 1.3.1)
i) Kernel Space and User Space
ii) Monolithic Kernel and Microkernel
iii) General purpose operating system and Real time operating system
iv) thread and process

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