GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:3151107   **Date:15-05-2025**

Subject Name:Advance Microcontroller

Time:02:30 PM TO 05:00 PM   **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	What is difference between branch instructions "B" and "BL" ?	**03**
	(b)	Explain optimization techniques of Embedded C Programming	**04**
	(c)	Explain the key features and components of the ARM7TDMI architecture. Discuss the ARM7TDMI processor modes	**07**
Q.2	**(a)**	Why interrupt latency of FIQ is less than IRQ in ARM Microcontroller?	**03**
	(b)	Discuss the advantages of using the ARM7TDMI Thumb state in low-power and code size-constrained applications. How does Thumb state reduce memory bandwidth and energy consumption compared to the ARM state?	**04**
	(c)	Explain difference between RISC and CISC architecture. Which RISC features are selected in ARM processor and which features are rejected in ARM processor?	**07**

OR

	(c)	Describe the ARM7TDMI pipeline architecture and the stages involved in the execution of instructions. Discuss the role of pipeline hazards and techniques such as forwarding and stalling in optimizing pipeline performance.	**07**
Q.3	**(a)**	Explain the concept of little-endian byte ordering in ARM7TDMI processors. How does byte ordering affect memory access and data representation?	**03**
	(b)	Explain the role of the ARM7TDMI Status Register (CPSR) in managing processor state and controlling program execution. Discuss the flags contained in the CPSR and their significance in instruction execution.	**04**
	(c)	Describe the ARM7TDMI interrupt handling mechanism and the process of prioritizing and servicing interrupts in ARM7TDMI-based systems.	**07**

OR

Q.3	**(a)**	What is will be content in register R3 after executing following instructions in ARM Microcontroller?	**03**

LDR R1,=0xFFFFFFFF

LDR R2,=0x11118888

BIC R3,R1,R2

	(b)	Discuss the role of the ARM7TDMI Link Register (LR) in function calls and returns. How is the LR register used to store the return address and control program flow during function execution?	**04**
	(c)	Describe the process of branching and conditional execution in ARM7TDMI assembly language programming. How are branch instructions encoded and executed, and how are conditional flags used to control program flow?	**07**

Q.4 **(a)** Write C Program to turn ON and OFF electrical device controlled by port pin P1.7 ON and OFF should be done at the interval of 10 second. Assuming relay driver circuit is available and connected with port pin P1.7 to control electrical device and devices turns ON when logic 1 is available on the port pin. **03**

(b) Explain the process of configuring and programming timers in ARM7TDMI to perform tasks such as generating precise delays with help of examples. **04**

(c) Explain following assembly language instructions: **07**
[a] LDMIA R0!,{R1-R7} [b] MVN R1,R3 [c] MOV R1,R2,LSL #2
[d] LDR R1,[R2] [e] RSC R0,R1,R2 [f] ADDEQ R0,R1,R2
[g] TST R1,R2

OR

Q.4 **(a)** Write equivalent assembly language instruction for following "C" statement: **03**
if (z==1) { R1=R2+(R3*4); }
Where z is Zero flag and R1,R2, R3 are registers

(b) Write C language program to set port pins P0.16 to P0.20 and P1.8 to P1.15 in ARM processor **04**

(c) Describe the principles of Pulse Width Modulation (PWM) and its applications in embedded systems. Discuss how PWM signals are generated using timers. Provide an example of using PWM to control the brightness of an LED with interfacing diagram. **07**

Q.5 **(a)** Describe the basic steps involved in configuring the ADC module of an ARM7TDMI microcontroller for analog input signal conversion. **03**

(b) Explain the role of page tables in virtual memory management. **04**

(c) Explain the concept of cache memory in ARM7TDMI processors and the benefits of using cache memory for improving memory access performance. **07**

OR

Q.5 **(a)** Explain the process of reading analog input values from the ADC data registers in ARM7TDMI programming. How are the converted digital values accessed and processed for further use in the application? **03**

(b) Describe the concept of address translation in virtual memory systems. **04**

(c) Describe the Advanced Microprocessor Bus Architecture (AMBA) in detail, highlighting its key components and their roles in ARM7TDMI-based systems. Discuss how AMBA facilitates high-performance and scalable interconnectivity between different system components. **07**

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