GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3151107   **Date:18-05-2024**

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 interrupt latency? How FIQ interrupt latency is reduced in ARM Microcontroller?	**03**
	(b)	For what type of applications ARM is preferred over AVR microcontroller? What is advantage of 32-bit processor over 8-bit processor?	**04**
	(c)	Explain ARM Architecture and Programming model. What are the special purpose registers? Explain importance of barrel shifter with example.	**07**
Q.2	**(a)**	Explain flags in ARM. What is the purpose of CPSR and SPSR?	**03**
	(b)	What problem will occur with pipeline during branch instruction? How this problem is resolved in ARM ?	**04**
	(c)	Explain following ARM assembly language instructions: (1) LDR R1,[R2,#8] (2) LDRB R1,[R0],#1 (3) TST R1,R2 (4) LDMIA R0!, {R1-R3} (5) CMN R1,R2 (6) ASR (7) BX	**07**

OR

	(c)	Why ARM is not known as pure RISC machine? What are the features selected in ARM from RISC machine and what are the features not adopted in ARM from RISC machine?	**07**
Q.3	**(a)**	What will be content of register R1 after executing following instruction. (Assume initial content of R1=0xFAFAFAFA and R2=0x55555555) BIC R1,R1,R2	**03**
	(b)	Discuss how to toggle the state of GPIO port pin P1.0. Explain the use of bitwise XOR (exclusive OR) to change the state of the pin. Write C program for toggling the P1.0 pin's state to generate square wave with highest frequency.	**04**
	(c)	What are the exceptions and interrupts in ARM ? How exception handling done?	**07**

OR

Q.3	**(a)**	What will be content of register R3 and R4 after executing following instructions ?
		   MOV R1,#0x11
		   MOV R2,#0x44
		   ORR R3,R2,#0xAA
		   AND R4,R1,R2
			03

	(b)	8 LEDs are connected to port pin P1.16 to 1.23. Write C program to blink (Flash) LED with any amount of delay.	**04**

	(c)	Describe how to configure a timer on an ARM microcontroller. Explain how to set the key parameters such as pre-scaler, clock source and mode of operation.	**07**
Q.4	**(a)**	Explain the steps involved in configuring and initializing the ADC module in an ARM microcontroller.	**03**
	(b)	What advantages does the AMBA architecture bring to ARM-based SoC designs? How does it improve system scalability, modularity, and performance?	**04**
	(c)	What are the advantages and disadvantages of C programming over assembly programming for embedded systems? Explain any two optimization techniques of C program with help of example	**07**

OR

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

	(b)	Explain branch instructions B and BL. What is the difference between B and BL?	**04**
	(c)	Describe the different types of AMBA buses, such as AHB (Advanced High-Performance Bus) and APB (Advanced Peripheral Bus). How do these buses differ in terms of functionality and performance?	**07**
Q.5	**(a)**	Digital sensor is connected to port pin P0.0 and Buzzer is connected to port pin P1.0. Write C Program to sound buzzer when digital sensor provides logic 1 and mute buzzer when digital sensor provides logic 0.	**03**
	(b)	What is virtual memory, and why is it essential in computer systems? Describe the primary purpose it serves in managing system memory.	**04**
	(c)	Write subroutines to set port pins IOSET() and clear port pins IOCLR() where pin number can be specified in argument in these subroutines. Write main program to set port pin P1.6 and clear port pin P1.4 using these subroutines.	**07**

OR

Q.5	**(a)**	Explain ADxCR (Analog to Digital Conversion Control Register) for channel selection, resolution and start of conversion.	**03**
	(b)	Describe the cache hierarchy commonly used in ARM processors, including L1, L2, and L3 caches. How do these levels of cache differ in terms of capacity, proximity to the CPU ?	**04**
	(c)	Explain the concept of PWM using timers. How can you generate PWM signals for controlling devices such as motors or LEDs using ARM Microcontroller? What are the registers useful for PWM programming?	**07**

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