Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Examination, Summer 2025

Course Code: 317 , Course Title:Microprocessor and Micro-controller

Level: 3 Term:1 Batch: 64

Time: 02:00 Hrs **Marks: 40**

Answer ALL Questions [Optional]

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	***a)***	A temperature monitoring system uses a microcontroller to read data from a temperature sensor and display it on an LCD screen **Show** the concepts of Microcontroller to answer the following question. What basic components are typically involved in a microcontroller?How does the microcontroller operate with these components?	**[5]**	**CO3**
2.	***a)***	You are working on a portable medical device that uses an STM32L4 microcontroller to process sensor data and display results on an LCD. The device must run on battery power for long periods, yet respond quickly to real-time events.**Illustrate** the processor organization and explain the process.	**[7]**	**CO3**
	b)	**Why** is the Harvard architecture of the Cortex-M4 beneficial in this application?	**[3]**	
3.	***a)***	You are designing a security system using an STM32 microcontroller. A motion sensor is connected to one of the GPIO pins configured to generate an external interrupt when motion is detected. When the interrupt occurs, the system should immediately turn on an alarm LED and log the event.**Analyse** the following task one by one. 1. How would you configure the GPIO pin connected to the motion sensor to generate an interrupt on the STM32? 2. What are the advantages of using an interrupt instead of continuously polling the sensor state? 3. Briefly describe what happens inside the microcontroller when the motion sensor triggers the interrupt. 4. How would you write the interrupt service routine (ISR) to handle turning on the alarm LED?	**[7]**	**CO3**

	b)	You want to build: ● **Device A:** A laptop computer that can run programs like web browsers and games. ● **Device B:** A digital wristwatch that shows time and controls alarms 1. Which device should use a **microprocessor** and which should use a **microcontroller**? 2. Give **two simple differences** between a microprocessor and a microcontroller.	**[3]**	
4.	***a)***	You are programming an 8-bit microcontroller. The AL register contains a status byte where each bit represents a sensor's state (1 = active, 0 = inactive): S7 S6 S5 S4 S3 S2 S1 S0 Currently, AL = 10110010b.Use the result of AL for each task. 1. Write the result of performing **(SAR AL, 1)** on this byte. Explain what happens to each bit. 2. After the shift, perform (ROR AL, 1) instruction. What will the new value be? Explain how bits move during this operation. 3. You need to check if the most significant bit and least significant bit were set **before** the shift. 4. If you want to **rotate the bits circularly to the left by 3 positions**, what instruction would you use and what is the resulting binary? 5. Write the instruction if ,Bits 4, 5, and 6 were inverted (bit-flipped). **Analyze** the results of SAR, ROR, and ROL on the original byte	**[7]**	**CO4**

	b)	mov ax, 0x1111
		mov bx, 0x2222
		call sub1
		mov cx, ax
		; End of program
		sub1:
		push bx
		mov bx, 0x3333
		call sub2
		pop bx
		Ret
		sub2:
		push ax
		add ax, bx
		pop ax
		ret
		Evaluate the final values of AX, BX, and CX after all calls and returns?
			[3]	

5		i.You are given a null-terminated ASCII string stored in memory starting at label STR1. Your task is to write assembly instructions to perform the following operation. Count the number of vowels (A, E, I, O, U) in the resulting string. ii.You have a string stored at SOURCE: "ASSEMBLY" **Find** the first occurrence of 'M' iii.A string is stored at STR: "ASM" **Write** an assembly routine to reverse the string	**[5]**	**CO4**