Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code:3141008 Date:27-05-2025

Subject Name: Microprocessor & Microcontroller

Time: 10:30 AM TO 01:00 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)**	List out the features of AVR microcontroller.	**03**
	(b)	Compare Microprocessor and Microcontroller.	**04**
	(c)	Draw and explain architecture of 8 bit 8085 microprocessor.	**07**
Q.2	**(a)**	Find the time delay generated by following delay subroutine if the system has an AVR with crystal frequency 1MHz. DELAY: LDI R20,200 LOOP2: LDI R21,100 LOOP1: NOP DEC R21 BRNE LOOP1 DEC R20 BRNE LOOP2 RET	**03**
	(b)	Draw and explain status register of AVR Microcontroller.	**04**
	(c)	Explain following instructions with proper example: 1. LDI 2. BREQ 3. CP 4. STS 5. PUSH 6. ADIW 7. OUT	**07**
		OR	
	(c)	Assume that the data memory location 0x315 contains FD (hex). Write an assembly language program to convert it into decimal and save the result into the location 0x322,0x323 and 0x324 Where least significant digit store into 0x322.	**07**
Q.3	**(a)**	Write an AVR C Program to send values 00 to FF on Port B.	**03**
	(b)	Write an AVR assembly language program to find number of 0s in 0x99.	**04**
	(c)	Explain various addressing modes of AVR microcontroller with appropriate example.	**07**
		OR	
Q.3	**(a)**	Differentiate Harvard architecture and von Neumann architecture.	**03**
	(b)	Read and test PORT B to see whether it has the value 45H. If it does, send 99H to PORTC otherwise cleared the PORTC.	**04**

	(c)	Interface 8k memory with starting address 8000h with 8085 microprocessors.	**07**
Q.4	**(a)**	What is need of RTC?	**03**
	(b)	A Switch is connected to pin PB0 and LED to pin PB7.Write a program to get the status of switch and send it to the LED.	**04**
	(c)	Write down the steps to program Timer0 in normal mode	**07**
		OR	
Q.4	**(a)**	Draw and explain fast PWM mode.	**03**
	(b)	Find the contents of register R20 after each of the following Instructions: (a) LDI R20,0X56 SWAP R20 (b) LDI R20,0X6A LDI R21,0X6A EOR R20, R21	**04**
	(c)	List out Programming steps to transfer and receive data serially from AVR using UART protocol.	**07**
Q.5	**(a)**	Draw interfacing of LCD with AVR for 8bit data.	**03**
	(b)	Write an AVR assembly language program to perform 15/2, store remainder in R20 register and quotient in R21 register	**04**
	(c)	Write down different steps in executing an Interrupt.	**07**
		OR	
Q.5	**(a)**	Discuss the SPSR register associated with SPI Protocol.	**03**
	(b)	Compare: 1. JMP and RJMP instructions. 2. RET and RETI instructions.	**04**
	(c)	List out the steps for programing A/D converter of AVR using polling method.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3141008 Date:10-07-2024

Subject Name: Microprocessor & Microcontroller

Time:10:30 AM TO 01:00 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)**	Which register is used to configure a PORT D as an input or output in AVR microcontroller? Write assembly language instruction to configure PORT D as an output port.	**03**
	(b)	What is the purpose of the General Purpose Registers (GPRs) in AVR microcontrollers? Which GPRs are used as 16 bit memory pointers?	**04**
	(c)	Explain the purpose of the Status Register (SREG) in AVR microcontrollers. Explain each flag of the SREG with help of example.	**07**
Q.2	**(a)**	Explain instructions SBIS and SBIC to check status of input pin in AVR microcontroller with help of example.	**03**

	(b)	Analyze following assembly language program and write content of register R16, R17 and status of C,Z,N,V,H and S flag after execution of the program.
		LDI R16,0x7F
		LDI R17,0x01
		ADD R16, R17
		HERE: RJMP HERE
			04

	(c)	Explain block diagram of 8085 microprocessor.	**07**
		OR	
	(c)	What is difference between 8085 microprocessor and ATMega32 Microcontroller? Explain memory space of AVR microcontroller	**07**
Q.3	**(a)**	Which register is useful to enable external interrupts in AVR Microcontroller? Write assembly language or C language instructions to enable external interrupts INT0, INT1 and INT2.	**03**
	(b)	Write assembly or C language program that responds to an external interrupt 0 (INT0) generated by a push button switch and toggles an LED connected to the pin PC7 of AVR microcontroller.	**04**
	(c)	What is the importance of stack memory in microcontroller? In which situation stack memory is utilized? Explain stack operations in AVR microcontroller with example.	**07**
		OR	
Q.3	**(a)**	Write set of instructions to store bit 4 from R17 to T flag and then copy T flag into bit 6 of register R18.	**03**
	(b)	Describe the control signals generated by the 8085 microprocessor during the instruction fetch and execution phases.	**04**

	(c)	Draw circuit diagram to interface common anode seven segment display with PORTD of AVR microcontroller. Interface two push button switches to generate external interrupts INT0 and INT1. Write assembly or C language program to display count values on seven segment display in such as way that count value should increment when external interrupt 0 is generated and count value should decrement when external interrupt 1 is generated.	**07**
Q.4	**(a)**	Write assembly language program to read data from pins of PORTC, compare data with value 0x80, Set port pin PD7 to high if data is greater than 0x80 and low if data is less than 0x80.	**03**
	(b)	Write assembly or C language program to rotate a stepper motor in both clockwise and counterclockwise directions using half-step control mode using PORTB of AVR microcontroller.	**04**
	(c)	Write assembly or C language program to toggle all bits of PORTB to continuously at every 100 microsecond. Use timer 0, CTC mode with 1:8 pre-scaler. XTAL=8 MHz	**07**
		OR	
Q.4	**(a)**	Explain ADC control and status register ADCSRA	**03**
	(b)	Write C or assembly language program to control a servo motor using pulse width modulation (PWM).	**04**
	(c)	Explain the steps involved in configuring the UART module in AVR microcontrollers for both transmission and reception.	**07**
Q.5	**(a)**	Explain the process of data transmission in SPI communication	**03**
	(b)	Consider that NPN type proximity sensor is connected to PD3 port pin and solenoid is controlled by PC5 port pin. Write assembly or C language program to read proximity sensor, when object is near to the proximity sensor, actuate the solenoid. Consider that in NPN proximity sensor, active low signal is generated when object is near to it and to actuate the solenoid, it needs active high signal from the port pin).	**04**
	(c)	Create a temperature monitoring system using an AVR microcontroller and a temperature sensor LM35. Draw interfacing diagram and write program in C or assembly language.	**07**
		OR	
Q.5	**(a)**	What are the different addressing modes supported by the I2C protocol?	**03**
	(b)	How does the baud rate affect UART communication? Which register is used to set baud rate? What value should be loaded in that register for 9600 baud rate for crystal frequency of 8 MHz?	**04**
	(c)	Draw interfacing diagram to interface 16x2 LCD module with AVR Microcontroller. Explain functions of RS and E pin. Write assembly or C language program to display message “HEALTH IS WEALTH” on LCD.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3141008 Date:17-07-2023

Subject Name:Microprocessor & Microcontroller

Time:10:30 AM TO 01:00 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.**

Q.1	**(a)**	Write the conditions when Parity flag, Zero flag and Sign flag will be set and reset in 8085.	**03**
	(b)	What is the size of stack pointer and program counter in 8085? Explain their functions also.	**04**
	(c)	Explain the function of following pins of 8085. 1. TRAP 2. SOD 3. HLDA 4. READY	**07**
Q.2	**(a)**	Explain (1) LDS (2) STS instruction with the help of an example.	**03**
	(b)	Draw and explain Data memory space of AVR with no extended I/O memory.	**04**
	(c)	List down criteria for choosing a microcontroller to use it in any electronics circuits and system.	**07**
		OR	
	(c)	Assume that R20 has packed BCD.Write a program to convert the packed BCD to two ASCII numbers and place them in R21 and R22.	**07**
Q.3	**(a)**	Write down the conditions when Negative flag and Overflow flag will be set and reset in AVR.	**03**
	(b)	Explain the function of DDRx,PORTx and PINx registers in AVR.	**04**
	(c)	Write a program to find number of 1s in a given byte.	**07**
		OR	
Q.3	**(a)**	What is branch penalty and its role in AVR?	**03**
	(b)	Specify the reasons for writing program in C language instead of assembly language.	**04**
	(c)	List down logical instructions used in AVR and explain any 4 of them with an example.	**07**
Q.4	**(a)**	List down sources of interrupts in the AVR.	**03**
	(b)	Explain function of each bit of TCCR0 (Timer/Counter Control Register).	**04**
	(c)	Explain following instructions with an example. 1.SWAP 2.ASR 3.ROL 4.LSR	**07**
		OR	
Q.4	**(a)**	Discuss the function of X, Y and Z register in AVR?	**03**
	(b)	Write a AVR C program to toggle only bit 4 of PORT C continuously without disturbing the rest of pins of PORT B.	**04**
	(c)	Write down steps to program Timer 2 in normal mode.	**07**
Q.5	**(a)**	Find the value for TCCR1A and TCCR1B to program Timer 1 as Normal mode and the OC1A generator as square wave generator and no prescaler.	**03**
	(b)	List down the registers associated with USART and explain the role of each register in brief.	**04**
	(c)	Write down steps to program A/D Converter using polling.	**07**
		OR	
Q.5	**(a)**	Explain with neat diagram, stepper motor interfacing with AVR	**03**
	(b)	Give the name and functions of register used for SPI Protocol.	**04**
	(c)	List down features of I2C protocol and explain any two in details.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3141008 Date:02-07-2022

Subject Name:Microprocessor & Microcontroller

Time:10:30 AM TO 01:00 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)**	List differences between 8085 Microprocessor or AVR Microcontroller.	**03**
	(b)	What is the role of DDR Register in GPIO Programming in AVR Microcontroller? Write assembly language instructions to initialize PORT A as an input and PORTD as an output port.	**04**
	(c)	What is the meaning of address space partitioning? Draw interfacing diagram to interface 16KB RAM and 16KB PROM with starting address 0000H and 8000H respectively	**07**
Q.2	**(a)**	Show how address bus and data bus are de-multiplexed to design 8085 microprocessor based application with help of diagram.	**03**
	(b)	List differences between RISC and CISC architecture. Write advantages of RISC architecture over CISC architecture.	**04**
	(c)	Explain Architecture of 8085 Microprocessor with diagram and explain important signals.	**07**
		OR	
	(c)	Explain Architecture of AVR Microcontroller with diagram. Which registers are used as memory pointers?	**07**
Q.3	**(a)**	What will be content of register R16 after execution of following instructions? SEC LDI R16,0x01 LSL R16	**03**
	(b)	Explain SBI, SBR, CBI and CBR instructions with help of examples	**04**
	(c)	Explain assembly language instruction used for comparison purpose. Write assembly language program using comparison instruction to Read 8 bit value from Port A, Compare it with reference value 080, If reading is greater than 0x80, set port pin PD0 and if reading is less than or equal to 0x80, reset port pin PD0.	**07**
		OR	
Q.3	**(a)**	8 LEDs are connected with PORTB of AVR Microcontroller such that Anode of LEDs tied together and connected to +5 V, Cathode of LEDs are connected to eight pins of Port B. Write instructions to (1) glow all LEDs (2) Turn off all LEDs (3) Glow alternate LEDs	**03**

	(b)	What will status of flags C,Z,V and S after execution of following instructions?
		LDI R16,0x88
		LDI R17,0xFF
			04

ADD R16, R17

(c) In AVR microcontroller application, NPN Type Proximity sensor is connected to PB0. Write assembly language program to Turn ON Solenoid connected to port pin PD7, if object is near to Proximity sensor. Assume that NPN Proximity switch gives logic 0 when object is near to it and solenoid is turned ON if controlling pin is at logic 1. **07**

Q.4 **(a)** Write AVR C Program to get status of port pin PA0 and send it to port pin PD0 continuously in infinite loop. **03**

(b) What is interrupt? Explain steps for executing interrupts. List any eight interrupts available in AVR Microcontroller. **04**

(c) Explain steps for enabling external interrupts for AVR microcontroller. Write program to toggle port pin PD7 when external interrupt 1 occurs. **07**

OR

Q.4 **(a)** What is need of timers in microcontroller? **03**

(b) How timer interrupts are enabled and disabled. Explain TIMSK register of AVR Microcontroller. **04**

(c) Write AVR C program to generate square wave of 16 KHz with 50% duty cycle on PB5 pin using Timer 0 generated delay. Assuming Crystal of 8 MHz **07**

Q.5 **(a)** What is difference between SPI and I2C ? **03**

(b) How SPI interfacing is better than UART interfacing for serial communication? Explain SPI signals showing interfacing of SPI device with AVR Microcontroller **04**

(c) Explain interfacing of 16x2 LCD with AVR Microcontroller. Write assembly or C language program to display message “Atmanirbhar Bharat” on the LCD. **07**

OR

Q.5 **(a)** Common anode seven segment display is connected to port D. Write assembly language or C language instructions to display number 6 on seven segment display. **03**

(b) Write C language program to rotate DC Motor in full speed. Assuming that DC motor is controlled by IC LM293D using port pins PC6 and PC7. **04**

(c) Draw stepper motor interfacing diagram in unipolar mode using port pins PD0 to PD3. Write C or assembly language program to rotate stepper motor in full step mode continuously in clockwise direction. When External interrupt 0 occurs, it should change to anticlockwise direction. **07**

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