Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV EXAMINATION – WINTER 2025

Subject Code:3141008 Date:01-12-2025

Subject Name: Microprocessor & 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)**	Differentiate between microprocessor and microcontroller.	**03**
	(b)	What is an Embedded system? List different applications of microcontrollers as an embedded system.	**04**
	(c)	Draw the internal architectural block diagram of AVR microcontroller and explain the function of each block in brief.	**07**
Q.2	**(a)**	Compare Harvard Architecture and Von Neumann Architecture.	**03**
	(b)	Explain the functions of following pins of 8085. 1. HOLD 2. INTA 3.SID 4. RESET	**04**
	(c)	How many branch instructions are there is AVR? Explain them briefly.	**07**
		OR	
	(c)	What criteria do designers consider in choosing microcontroller? Explain in the brief reason for each criterion.	**07**
Q.3	**(a)**	Write a program to find no of 1s in given byte.	**03**
	(b)	What is the difference between RET and RETI instructions? Explain why we cannot use RET instead of RETI as the last instruction of an ISR	**04**
	(c)	Write a program to load 0x55 in PORTB register and complement PORTB 100 times.	**07**
		OR	
Q.3	**(a)**	Explain any three Bit manipulation instructions with example	**03**
	(b)	Write Pros and cons of C and assembly language programming	**04**
	(c)	Explain following instructions for ATmega32. (1) ROL (2) NEG (3) LDI (4) OUT (5) SBI (6) SBR (7) SWAP	**07**
Q.4	**(a)**	Draw and explain TCCR0 register for ATMega32.	**03**
	(b)	Explain the functioning of DDRX, PORTX, and PINX registers with appropriate example.	**04**
	(c)	Write a program in C to generate a square wave of 3 KHz on pin PORTB.3. Use XTAL= 8 MHz, Use timer 0.	**07**
		OR	
Q.4	**(a)**	What is the difference between JMP and RJMP?	**03**
	(b)	What is the function of status register? Explain and differentiate overflow flag and carry flag in context with AVR.	**04**
	(c)	Write an Embedded C program to create a square wave of 50% duty cycle on pin PORTB.5. Timer 2 is used to generate the time delay.	**07**
Q.5	**(a)**	Explain with neat diagram, stepper motor interfacing with AVR.	**03**
	(b)	List down the characteristics of ADC peripheral of ATMega32.	**04**
	(c)	List serial interrupts available in AVR microcontroller. Write an ALP to receive serial data through serial port and display the same on port C.	**07**
		OR	
Q.5	**(a)**	How to enable and disable interrupt in ATmega32?	**03**
	(b)	Write the steps for writing data from SPI Device in multi byte burst mode.	**04**
	(c)	With neat diagram and appropriate programming example discuss the interfacing of LCD with AVR microcontroller.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3141008 Date:03-12-2024

Subject Name:Microprocessor & 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)**	High light main differences between microprocessor and microcontroller	**03**
	(b)	Explain role of microcontroller in embedded systems	**04**
	(c)	Explain internal architecture of 8085 Microprocessor. What is the significance of flags in the 8085 microprocessor? Explain any two flags.	**07**
Q.2	**(a)**	What is the AVR status register, and what information does it hold?	**03**
	(b)	Explain any four bit manipulation instructions in AVR microcontroller with example.	**04**
	(c)	What is importance of General Purpose Input Output (GPIO) Ports in Microcontroller ? Explain DDR, PIN and PORT registers associated with GPIO with neat sketches.	**07**
		OR	
	(c)	Consider that Ignition Switch is connected to PD1, Seat belt switch is connected to PD2 Buzzer is connected to PC3 and LED is connected to PC4. Write C Program for AVR microcontroller such that it turn on LED and sound buzzer if the key is in the ignition closed(PD1 is at logic 0), but seat belt is not latched (PD2 is at logic 1).	**07**
Q.3	**(a)**	Which register is used to configure a PORT C as an input or output in AVR microcontroller? Write assembly language instruction to configure PORT C as an output port.	**03**
	(b)	Draw interfacing diagram to interface push-button switch with port pin PD0. Explain instructions SBIS and SBIC to check status of input pin PD0 in AVR microcontroller with help of example.	**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)**	What will be value of Program Counter (PC) when we connect power supply pin Vcc to RESET pin in AVR Microcontroller? Draw power on RESET circuit.	**03**
	(b)	What are the methods by which we can generate time delay in AVR Microcontroller? Write a simple C program for generating a time delay in AVR.	**04**

	(c)	Write assembly or C language program to toggle all bits of PORTD continuously at every 200 microsecond. Use timer 0, CTC mode with 1:8 pre-scaler. XTAL=8 MHz	**07**
Q.4	**(a)**	Write assembly language program to read data from pins of PORTA, compare data with value 0x7F, Set port pin PD0 to high if data is greater than 0x7F and low if data is less than 0x7F.	**03**
	(b)	What is interrupt? Explain the process of configuring interrupts in AVR	**04**
	(c)	Assuming that program ROM space starting 0x600 contains message "UNIVERSAL HUMAN VALUES". Write assembly language program to send all message characters to PORTD one byte at a time using look up table method.	**07**
		OR	
Q.4	**(a)**	What are the advantages of using assembly language in time-critical applications?	**03**
	(b)	Compare SPI and I2C protocols	**04**
	(c)	Describe process of interfacing LCD with AVR Microcontroller with interfacing diagram and write program to display message "Microprocessor" and on first line and "Microcontroller" on second line of 16x2 LCD display.	**07**
Q.5	**(a)**	Explain ADC control and status register ADCSRA	**03**
	(b)	Draw interfacing diagram of one push-button switch and relay with AVR Microcontroller. Write program such that status of relay should toggle at every press of push-button switch.	**04**
	(c)	List any four applications of servo motor. Explain interfacing of servo motor with AVR Microcontroller and write program to control servo motor for angle 0^0, 90^0 and 180^0.	**07**
		OR	
Q.5	**(a)**	Discuss interrupt versus polling method of getting service of microcontroller by the device. Which method is more efficient in terms of response time?	**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)	Discuss the role of PWM in controlling DC motors with AVR. Interface DC motor with AVR microcontroller with Motor driver chip. Write program to rotate DC motor. Interface two push-button switches at pin PD0 and PD1. Speed of DC motor should increase in step when switch connected with PD0 is pressed and should decrease when switch connected with PD1 is pressed.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3141008 Date: 06-02-2024

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)**	What will be value of Program Counter (PC) when we connect power supply pin Vcc to RESET pin in AVR Microcontroller? Draw power on RESET circuit.	**03**
	(b)	Explain role of microcontroller in Embedded System	**04**
	(c)	What is importance of General Purpose Input Output (GPIO) Ports in Microcontroller ? Explain DDR, PIN and PORT registers associated with GPIO with neat sketches.	**07**
Q.2	**(a)**	Explain concept of little endian and bid endian with example	**03**
	(b)	Can we use LDS instruction to copy content of I/O register into GPR? What is the difference between IN instruction and LDS instruction?	**04**
	(c)	Consider that Ignition Switch is connected to PD0, Seat belt switch is connected to PD1 Buzzer is connected to PD3 and LED is connected to PD2. Write C Program for AVR microcontroller such that it turn on LED and sound buzzer if the key is in the ignition (PD0 closed), but seat belt is not latched.	**07**
		OR	
	(c)	Write assembly language program to load byte 0x55 in PORT B and complement it 100000 times with minimum delay.	**07**
Q.3	**(a)**	Explain difference between JMP, RJMP and IJMP instructions	**03**
	(b)	Explain SBI and CBI instructions with examples	**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)**	How to check status of input pin in AVR microcontroller? Explain instructions SBIS and SBIC.	**03**
	(b)	Write assembly language program to keep monitoring port pin PB5, send byte 0x11 to PORT A if PB5 is high and 0x22 to PORT A if PB5 is low.	**04**
	(c)	How serializing a byte of data done? Write assembly language program to bring byte of data serially via pin PC7 and save it in R20 register. Assume that byte comes in with the LSB first.	**07**
Q.4	**(a)**	Write set of instructions to store bit 3 from R16 to T flag and then copy T flag into bit 5 of register R17.	**03**
	(b)	What is importance of look up table in microcontroller? In which situations, look up table is used?	**04**

(c) Assuming that program ROM space starting 0x600 contains message " HOPE FOR WORLD PEACE". Write assembly language program to send all message characters to PORTB one byte at a time using look up table method. **07**

OR

Q.4 **(a)** What will be content of register R16 after execution of following instructions? **03**

```
CLC
LDI R16,0x11
LSR R16
```

(b) Write C program to toggle all bits of PORT C continuously at the interval of approximately 1 second. **04**

(c) Explain interfacing of 16x2 LCD with AVR Microcontroller. Write assembly or C language program to display message "ONE NATION" on the first line and "ONE ELECTION" on second line of the LCD. **07**

Q.5 **(a)** Discuss interrupt versus polling method of getting service of microcontroller by device. Which method is efficient? **03**

(b) Explain TCCR0 timer register. What value should be loaded to TCCR0 to program Timer 0 in normal mode with external clock source (falling edge) on T0 pin. **04**

(c) Draw stepper motor interfacing diagram in unipolar mode using port pins PA0 to PA3. 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**

OR

Q.5 **(a)** What is importance of monitoring UDRE flag while writing byte into UDR register during serial transmission ? **03**

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

(c) Explain steps for enabling external interrupts for AVR microcontroller. Write program to toggle port pin PD3 when external interrupt 0 occurs. **07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3141008 Date:16-12-2022

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)**	What is the importance of flags in Microprocessor and Microcontroller? Explain any three flag bits of 8085 Microprocessor or AVR Microcontroller.	**03**
	(b)	Explain need of Stack pointer and Program counter in Microprocessor and Microcontroller. What is the size of Program counter and Stack pointer in 8085 Microprocessor & AVR ATMega32 Microcontroller	**04**
	(c)	Discuss Architecture of AVR ATMega32 Microcontroller architecture. What features are different then 8085 Microprocessor architecture?	**07**
Q.2	**(a)**	512 Kbit Memory chip has 8 pins for data. Find out number of address lines in this chip.	**03**
	(b)	Give difference between Harvard and von Neumann architectures.	**04**
	(c)	What is the necessity of branch instructions and looping in microcontroller? Write assembly language program using branch instruction to load data 0xAA in PORTB and complement it 400 times	**07**
		OR	
	(c)	Explain relative call (RCALL) and indirect call (ICALL) instructions with example. What is the role of stack for CALL instruction?	**07**

Q.3	**(a)**	What will be status of C, H and Z flags after the addition of 0x38 and 0x2F using following instructions?
		LDI R16,0x38
		LDI R17,0x2F
		ADD R16, R17
			03

	(b)	Explain any four assembler directives with example	**04**
	(c)	Explain following instructions with example: (i) STS (ii) OUT (iii) SBIS (iv) ORI (v) CBI (vi) BLD (vii) BRBC	**07**
		OR	

Q.3	**(a)**	What will be status of overflow flag if numbers 0x60 and 0x46 added using following instructions?
		LDI R16,0x60
		LDI R17,0x46
		ADD R16, R17
			03

	(b)	Explain overflow problem in signed number operations. When overflow flag V set?	**04**
	(c)	Write assembly language program for following task: To monitor switch connected to port pin PB2 continuously. When switch is not pressed PB2 is high and when switch is pressed PB2 becomes low. When Switch is pressed write value 0x55 to port A else write 0x66 to port A.	**07**

Q.4	**(a)**	Write AVR program in C language to send values -10 to +10 to PORTB	**03**
	(b)	Write AVR C Program to get status of PB5 and send it to PC7 continuously.	**04**
	(c)	Explain steps for enabling external interrupts of AVR microcontroller. Write program to toggle port pin PC3 when external interrupt 0 occurs.	**07**

OR

Q.4	**(a)**	Discuss AVR fuse bits for oscillator clock source selection	**03**
	(b)	Explain working of brown out detector. Why brown out reset is important?	**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 the use of UBRR register?	**03**
	(b)	For 8 bit ADC, Vref = 2.56 V Calculate D0-D7 output if analog input is 2.1 V	**04**
	(c)	Write Assembly or C language program to continuously transmit message “Azadi Ka Amrit Mahotsav” serially at 9600 baud rate, 8 bit data and 1 stop bit	**07**

OR

Q.5	**(a)**	Explain SPI signals in brief showing interfacing of SPI device with AVR Microcontroller	**03**
	(b)	What is the difference between SPI and I2C interface? Why I2C is known as two wire interface?	**04**
	(c)	Explain interfacing of 16x2 LCD with AVR Microcontroller. Write assembly or C language program to display message “Azadi Ka Amrit Mahotsav” on the LCD.	**07**

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