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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