Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2151001 **Date: 03/05/2017**

Subject Name: Microcontroller and Interfacing (EC)

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.**

			MARKS
Q.1		**Answer the following questions. (Two marks each)**	**14**
	1	What is size of code and data memory associated with ATmega32 microcontroller?	
	2	How many 8bit and 16bit general purpose registers are available in ATmega32 Microcontroller?	
	3	How many channels ADC and PWM channels are available on ATmega32 Microcontroller?	
	4	Which registers are used to store result of Analog to Digital conversion in ATmega32 Microcontroller?	
	5	Calculate the number of times following loop will be executed? (a) up: LDI R17,0x16 DEC R17 RJMP up (b) LDI R20, 0x09 XYZ: ROR R20 BRSH XYZ	
	6	Find the value of TCCR0 to use timer 0 in Normal mode with prescaler 64 and in CTC mode with prescaler 8.	
	7	Identify the addressing modes of following instructions. (a) OUT 0x55, R20 (b) RJMP back	
Q.2	**(a)**	Discuss criterion to select microcontroller.	**03**
	(b)	Explain usage of AVR status register.	**03**
	(c)	Explain following instructions with appropriate example. (a) SBRS (b) LDS (c) SWAP (d) MULS	**08**
		OR	
	(c)	Explain following instructions with appropriate example. (a) EOR (b) BRNE (c) ST (d) ASR	**08**
Q.3	**(a)**	Write a program to generate time delay of 4ms using timer 0 in normal mode. Using time delay generate square wave on pin 3 of Port B. Choose prescaler = 256. Exclude the instruction overhead due to the instructions in loop. Use XTAL = 8MHz	**07**
	(b)	Draw and discuss program and data memory map of ATmega32 microcontroller.	**07**

OR

Q.3 **(a)** Discuss various directives associated with AVR assembly language programming. Also list steps for assembly language programming. **07**

(b) For a given code find the time period generated by delay routine. Exclude the instruction overhead due to the instructions in loop. XTAL = 8MHz **07**
Also explain which type of waveform will be generated and what will be its frequency.

```
   LDI R16,0x20
   SBI DDRB, 5
   LDI R18,7EH
Begin:  SBI PORTB,5
   OUT TCNT0,R18
   RCALL DELAY
   CBI PORTB,5
   OUT TCNT0,R18
   RCALL DELAY
   RJMP Begin

Delay:  LDI R20,0x04
   OUT TCCR0,R20
Again:  IN R20,TIFR
   SBRS R20,TOV0
   RJMP Again
   LDI R20,0x0
   OUT TCCR0,R20
   LDI R20,(1<<TOV0)
   OUT TIFR,R20
   RET
```

Q.4 **(a)** Explain steps in executing interrupt in AVR ATmega32 microcontroller. **03**

(b) Write an AVR C program to toggle all the bits of Port B 100 times. **04**

(c) Discuss steps of AVR serial port programming. Also discuss registers associated with serial programming and baud rate generation mechanism. **07**

OR

Q.4 **(a)** How to enable and disable interrupt in AVR ATmega32 microcontroller. **03**

(b) Write AVR assembly program to check if the internal RAM location $140 contains an even value. If so, write 0x55 into location $200. If not, write 0xAA into location $200. **04**

(c) For AVR ATmega32 microcontroller, assume that INT0 pin is connected to a switch that is normally high. Write a C program that toggles PORTC.3, whenever INT0 pin goes low. Use external interrupt in level triggered mode. Explain your program with necessary comments. **07**

Q.5 **(a)** With diagram explain LCD interfacing with ATmega32 microcontroller. **07**

(b) Discuss I^2C bus protocol with appropriate diagram. **07**

OR

Q.5 **(a)** Discuss temperature sensor interfacing with ATmega32 and write a program to display temperature on PORT D. **07**

(b) With connection diagram discuss DC motor control using Darlington transistor and using MOSFET transistor. **07**

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