



# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Computer Science and Engineering

Semester End Examination; July / August - 2022

AVR Microcontroller

Time: 3 hrs

Max. Marks: 100

## Course Outcomes

The Students will be able to:

CO1--**Compare and contrast** Microprocessor and Microcontroller

CO2- **Code** simple AVR assembly language instructions

CO3- **Code** assembly language to use the ports for input or output

CO4- **Code** c program for time delay, logical and arithmetic operations and fro data serialization

CO5- **Interfacing** the keypad to the AVR using assembly and C

**Note:** i) PART-A is compulsory. One question from each unit for maximum of 2 marks.

ii) PART-B: Answer any **TWO** sub questions (from a, b, c) from each unit for a Maximum of 18 marks.

Q. No.	Questions	Marks	BLs	COs
<b>I : PART - A</b>		<b>10</b>		
I a.	Discuss the following with respect to ATmega169:			
	i) Size of ROM			
	ii) Size of PC	2	L2	CO2
	iii) Last address of the location in code ROM			
	iv) Is it byte addressable or word addressable?			
b.	Show a simple AVR code to send 0X99 to Port B and Port C	2	L1	CO3
c.	Determine the content of R1 register and status register after the execution of the following instruction by assuming R1 = \$95 and R2 = \$4F CF = 1	2	L2	CO4
	ADC R1,R2			
d.	List the three parts of Macro.	2	L1	CO4
e.	Why is the use of packed BCD preferable to ASCII.	2	L2	CO2
<b>II : PART - B</b>		<b>90</b>		
<b>UNIT - I</b>		<b>18</b>		
1 a.	Differentiate between;			
	i) Micro processor and Microcontroller	9	L2	CO1
	ii) Harvard Architecture and Vonnuman architecture			
	iii) SRAM and DRAM			
b.	Explain AVR status register what is largest hex value that can be moved into a location in the data memory? What is its decimal equivalent?	9	L2	CO1
c.	With figure, explain data memory for AVR's with extended I/O memory.	9	L2	CO1

**UNIT - II**

**18**

- 2 a. Explain the following instruction with an example:
- i) BREQ 6 L2 CO3
  - ii) CALL
  - iii) CBI
  - ii) using stack write a program to swap two number 3 L3 CO3
- b. Name the ports of 40 pin AVR and explain. A switch is connected to PB3. Using bit manipulation instruction write a program to check the status of switch and perform the following: 9 L2 CO3
- if  $s_w = 0$  send letter 'N' to port D  
 if  $s_w = 1$  send letter 'Y' to port D
- c. I) Explain the following instruction with an example: 6 L2 CO3
- i) RJMP                      ii) SBIS                      iii) BRLO
- II) Using out instruction for AVR chip write sequence of instruction to toggle all the bits of PORT B, PORTC and PORT D continuously 3 L2 CO3

**UNIT - III**

**18**

- 3 a. Explain the following instruction with syntax and example.
- i) ADC                      ii) AND                      iii) BRVS
- also determine the content of R20 after the execution of each instruction  
 show each step 9 L2 CO4
- i) LDI R20, 0X56                      ii) LDI R20, 0X39
  - swap R20                      SEC
  - ROR R20                      ROL R20
  - ROR R20                      ROL R20
- b. Explain the difference between C and V flags and where each one is used. Assume port B is an input port connected to temperature sensor. Write a program to read the temperature and test it for value 75. According to the test result place the temperature value in the register indicated by the following 9 L3 CO3
- If  $T = 75$  R16 = T R17 = 0 R18 = 0  
 If  $T > 75$  R16 = 0 R17 = T R18 = 0  
 If  $T < 75$  R16 = 0 R17 = 0 R18 = T
- c. I) Explain the following instruction with an example: 6 L2 CO3
- i) ex-OR                      ii) NEG                      iii) ASR

II) Write a code to add two signed number stored at 0X200 and 0X201 the result is stored at 0X202. If the result is not collect the program should put 0XAA to Port A char R21

3 L2 CO3

**UNIT - IV**

**18**

4 a. Show code to convert packed BCD to two ASCII numbers and place them in R21 and R22

9 L2 CO3

b. Explain the following addressing mode with an example to each:

9 L2 CO3

i) Register                      ii) Direct                      iii) Register indirect

c. i) Define macro and explain the same with an example. Also list the advantage of it

5 L2 CO3

ii) Differentiate between macro and subroutine. Which one will use more flash ROM

4 L2 CO2

**UNIT - V**

**18**

5 a. i) List and explain the ways to create time delay in C. Also list factor that can affect delay size

4 L2 CO4

ii) Write an AVR C program to toggle all the pins of Port C continuously with delay

5 L3 CO4

b. Write an AVR C program to covert \$FD to decimal and display the digits on PB, PC and PD

9 L3 CO4

c. Explain the interfacing of keyboard to AVR with flowchart and figure.

9 L2 CO5

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