

**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; August - 2023****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. Two marks for each question.II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
1 a.	What is the size of program ROM of ATmega32 and how many locations are there?	2	L1	CO1	PO1,2,3
b.	Write instruction/s to set Z flag and clear H flag.	2	L1	CO2	PO1,3
c.	Show how CPU would subtract \$05 from \$43. Also write the conditional flags affected.	2	L2	CO2	PO1,3
d.	Write the macro expansion for the code snippet given below: .MACRO LOADIO LDI R20, @1 OUT @0, R20 .ENDMACRO .ORG 0 LOADIO DDRB, 0XFF LOADIO PORTB, 0X55	2	L1	CO2	PO1,3
e.	Give the magnitude of the unsigned int and signed int data types.	2	L2	CO2	PO1,3
II : PART - B		90			
UNIT - I		18			
2 a.	Explain AVR data memory.	9	L2	CO1	PO1,2,3
b.	Explain the AVR Status Register. Show the status of all conditional flags after the addition of 0X7C and \$A5.	9	L2	CO1	PO1,2,3
c.	What are assembler directives? List them and explain any two directives with example for each.	9	L2	CO1	PO1,2,3

UNIT - II**18**

- 3 a. Write flowchart and program to clear R20 then add 3 to R20 10 times and send the sum to PORTB. Use looping concept. 9 L3 CO2 PO1,3
- b. Explain how stack is accessed in the AVR and also explain the role of stack when CPU executes CALL and RET instructions with an example. 9 L2 CO2 PO1,3
- c. Write a program to get the status of PD6 and PD7, if both are 1 display 'Y' else display 'N' on PC7. 9 L3 CO3 PO1,2,3

UNIT - III**18**

- 4 a. With code snippets illustrate the working of following Jump instructions: 9 L2 CO2 PO1,3
- i) BRNE ii) BRLO iii) BRSH
- b. Explain the following instruction with syntax and example: 9 L4 CO2 PO1,3
- i) ADC ii) AND iii) LSL
- Also determine the content of R20 after the execution of each instruction show each step
- I) LDI R20, 0X5B II) LDI R20, 0X3A
- SWAP R20 SEC
- ROL R20 ROR R20
- ROL R20 ASR R20
- c. Explain the difference between N and S flags. 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 PO1,2,3
- If $T = 75$ $R16 = T$ $R17 = 0$ $R18 = 0$
- $T > 75$ $R16 = 0$ $R17 = T$ $R18 = 0$
- $T < 75$ $R16 = 0$ $R17 = 0$ $R18 = T$

UNIT - IV**18**

- 5 a. Write AVR assembly program to convert packed BCD to two ASCII numbers and place them in R21 and R22, use function to convert. 9 L2 CO2 PO1,3
- b. Define addressing mode. List them and explain any two types of addressing mode with an example to each. 9 L2 CO2 PO1,3
- c. Write ALP program to count number of odd and even numbers among n bytes of data stored starting from \$200. (Use indirect addressing mode). 9 L3 CO2 PO1,3

UNIT - V**18**

- 6 a. List and explain the ways to create time delay in C with example program. Also list factor that can affect delay size. 9 L2 CO4 PO1,2,3
- b. i) Write an AVR C program to monitor bit 4 of Port B continuously without disturbing the rest of the pins of Port B. 9 L3 CO4 PO1,2,3
- ii) Write an AVR C program to monitor bit 5 of Port C. If it is HIGH, send 55H to Port B, otherwise, send AAH to Port B.
- c. Explain in detail memory allocation in C programming language for AVR to store data. 9 L2 CO4 PO1,2,3

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