Department of Electronics & Telecommunication Engineering

Experiment No.: SIX

Microcontroller & Applications

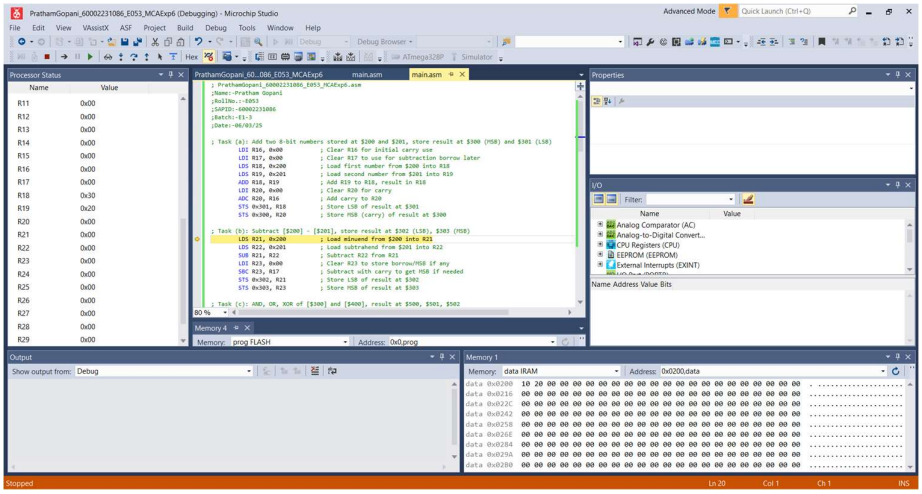
Name: **Batch/Rollno:**

SAP ID: **Date:**

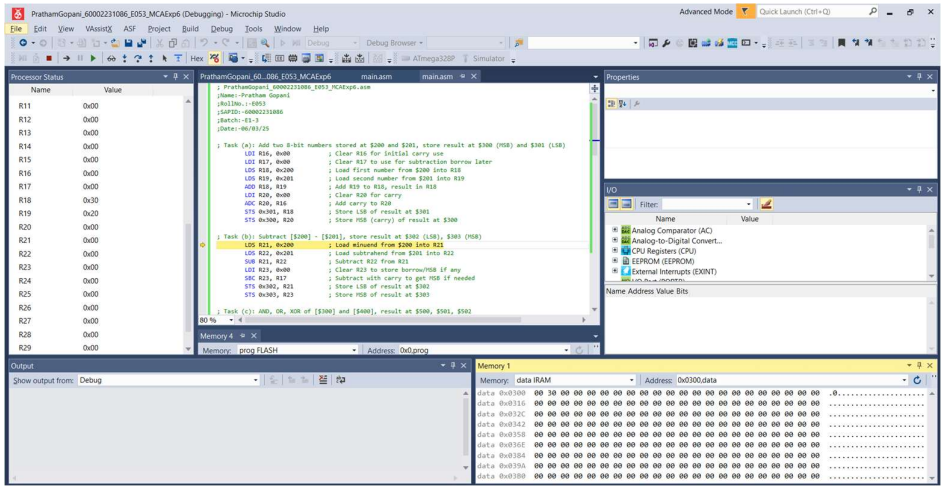
Objective:	Assembly language programming in simulation environment for AVR's microcontroller ATmega328p.
Outcome:	Programs that demonstrate the understanding and use of arithmetic, logical, rotate/shift and branching instructions in light of accomplishing specific tasks.
Tasks/Problem Statement:	Students Perform following tasks: a. Write a program to add two 8-bit numbers stored in at data memory location $200 and $201, data memory location and store the result at memory location $300 and $301, MSB first and then LSB. Verify the program working for worst case data condition. b. Repeat the above program to subtract two numbers ie [$200] - [$201] (contents of location 201 subtracted from location 200) c. Write a program to logically AND, OR and XOR two numbers stored at memory locations $300 and $400 and store the result of operation at location $500. d. Write a program that inspects the contents of memory location $200. If the content is zero ($00) then store $00 at memory location $300, else store $ff at location $300. e. Write a program that inspects the lower nibble of the number stored at memory location $200. If the lower nibble is $F (ie all ones) then store $ff at memory location $300, if its $0 (ie all zeros) then store $00 at memory location $300, else store $7f at location $300. f. Write a program to toggle specific bits in a register and / or logically shift (rotate the bits in register
Programs,	A)

comments, brief explanation and output:

INPUT:-

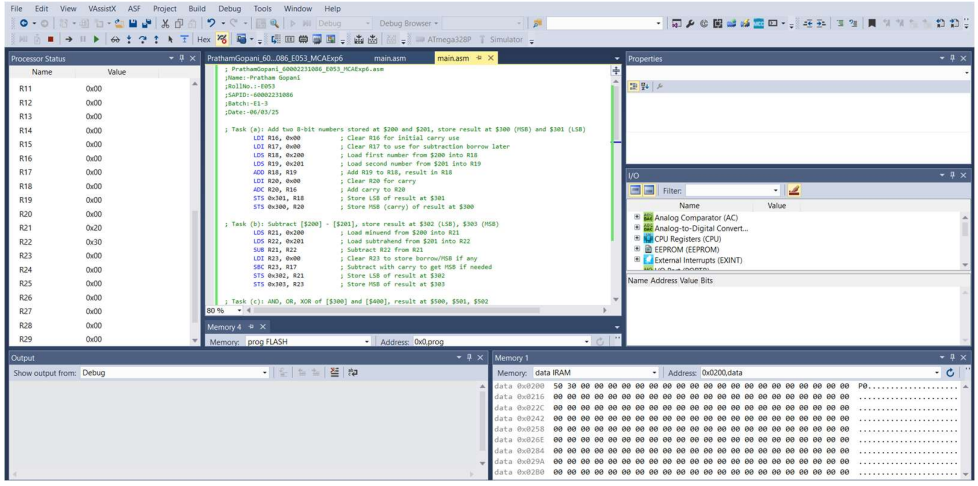


OUTPUT:-

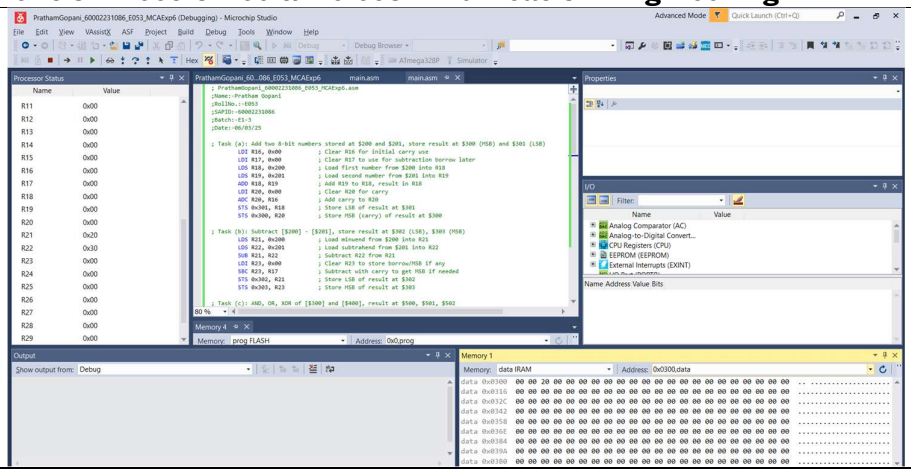


B:-

INPUT:-

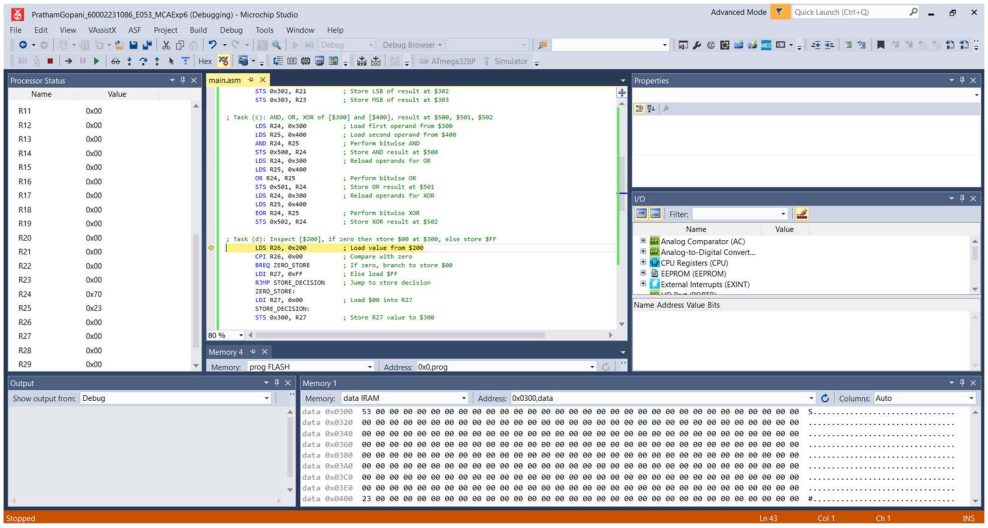


OUTPUT:-

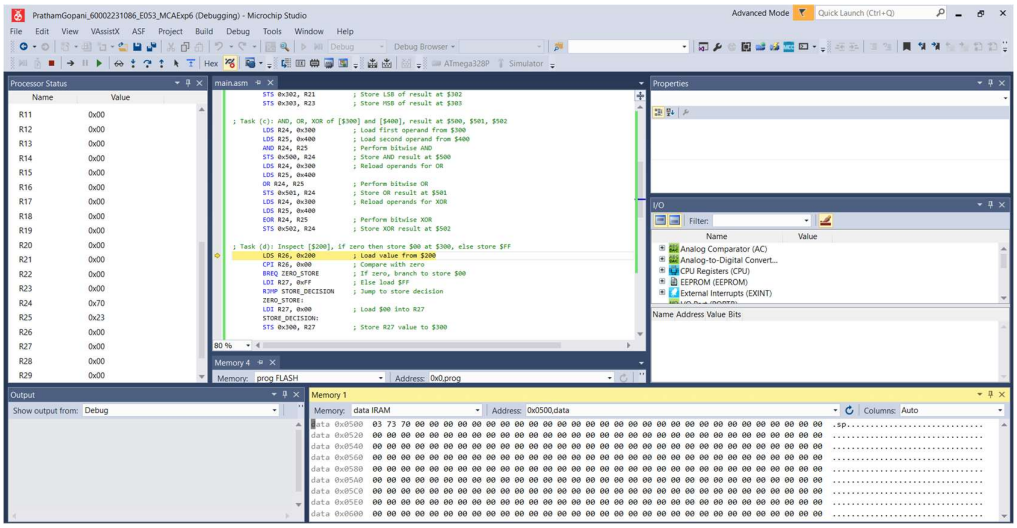


C:-

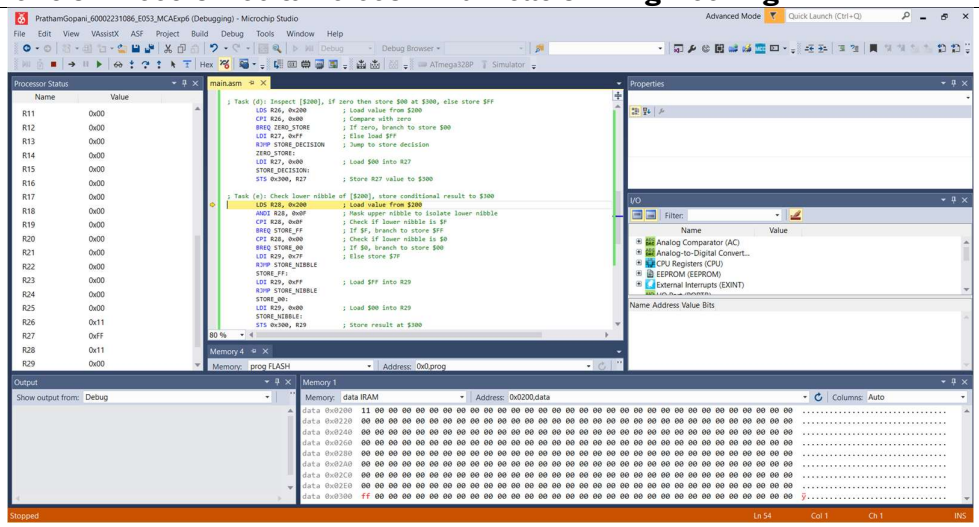
INPUT:-



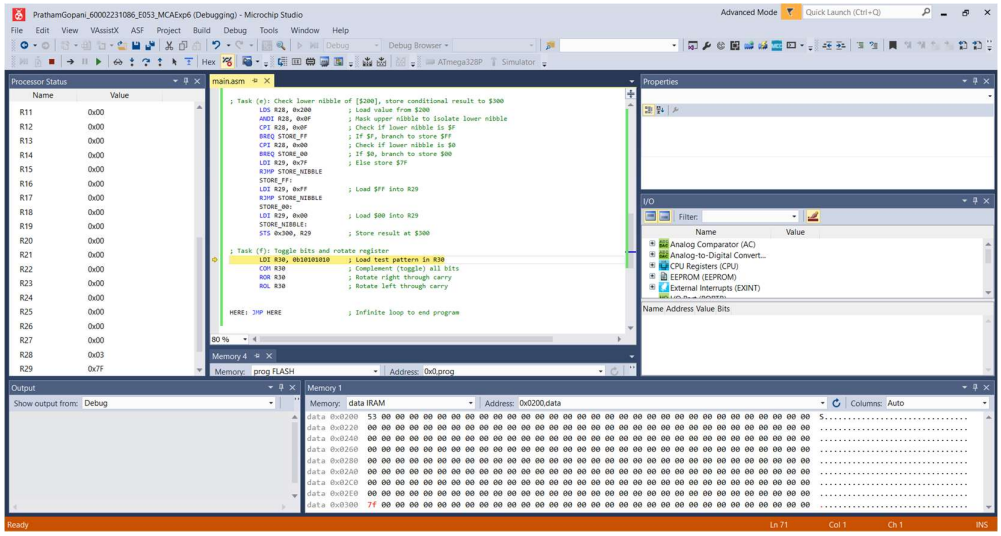
OUTPUT:-



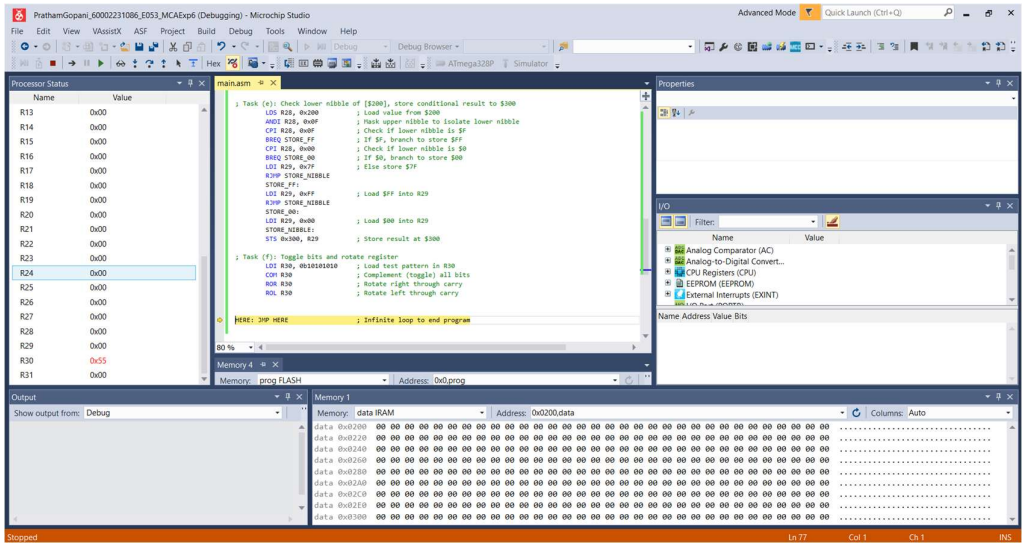
D:-

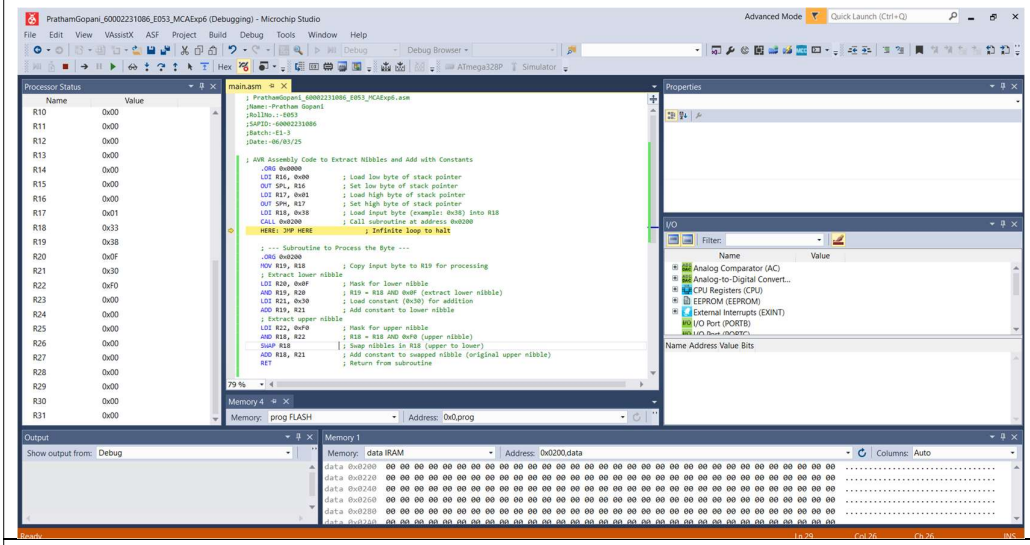

PrathamGopani_60002231086_E053_MCAExp6 (Debugging) - Microchip Studio
main.asm
Processor Status
Properties
I/O
Memory 1
Output
Stopped

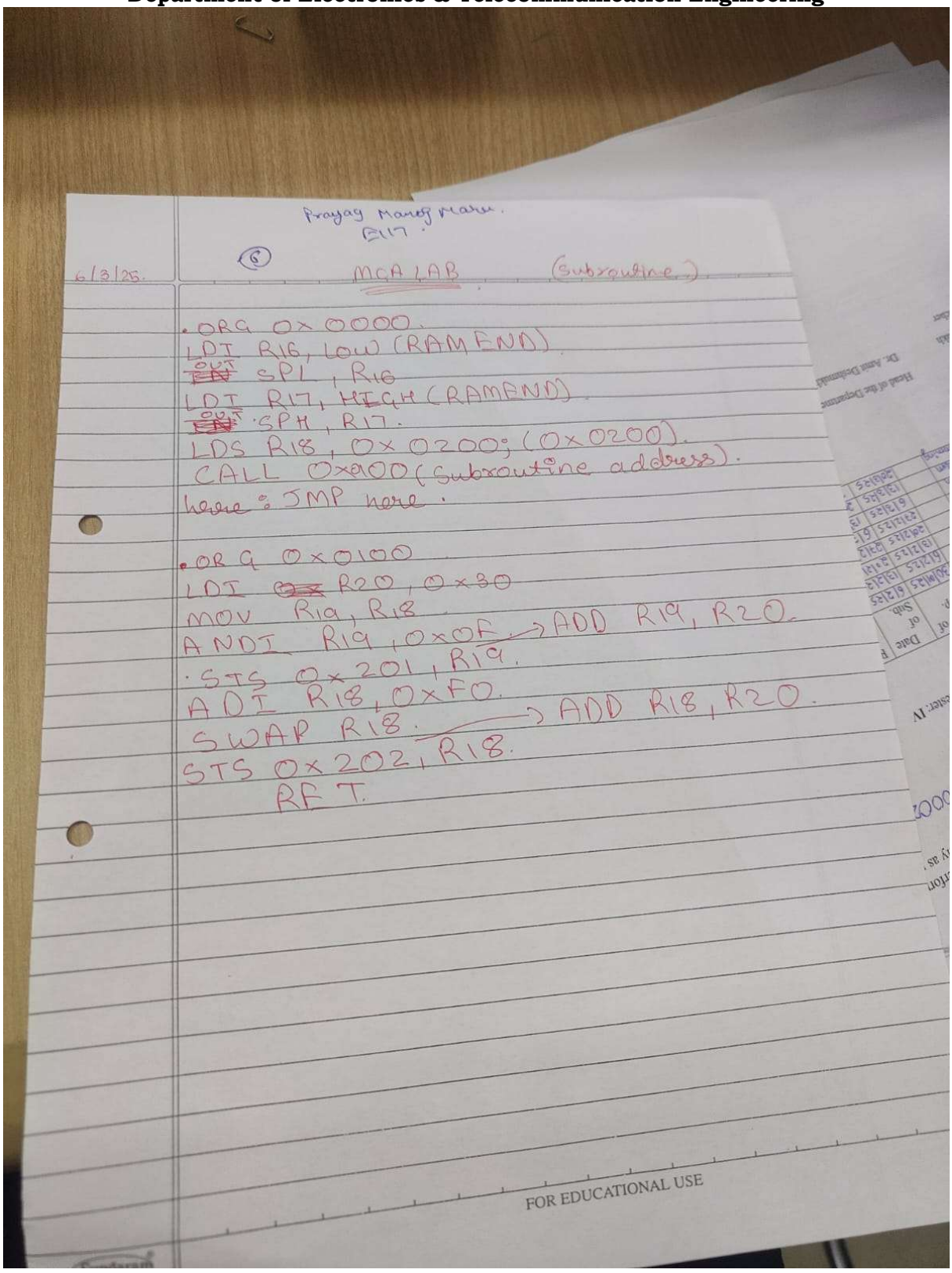
E:-


PrathamGopani_60002231086_E053_MCAExp6 (Debugging) - Microchip Studio
main.asm
Processor Status
Properties
I/O
Memory 1
Output
Ready

F:-


PrathamGopani_60002231086_E053_MCAExp6 (Debugging) - Microchip Studio
main.asm
Processor Status
Properties
I/O
Memory 1
Output
Stopped

	1) Write an AVR assembly language program to extract and add the nibbles of a byte.The input byte is initially loaded into a register. The lower and upper nibbles are separated, added individually with given constants, and then processed through bit manipulation. Show the result in a R18 & R19.  *Attach screen shots of the output* ***NOTE:*** *Each code output should display student SAP id as well as Name of student along with date of performance.*
Conclusion :	This experiment successfully demonstrates the implementation and simulation of arithmetic, logical, conditional branching, and bit manipulation instructions in AVR assembly for the ATmega328P microcontroller. Through a series of structured tasks, gained hands-on experience in handling memory operations, evaluating register content, and controlling program flow based on specific data conditions—validating both normal and edge-case scenarios.



Prayag Mangrulkar.
D117.

6/3/25. (6) MCA LAB (Subroutine.)

```
.ORG 0x0000.
LDI R16, LOW(RAMEND)
OUT SPL, R16
LDI R17, HIGH(RAMEND)
OUT SPH, R17.
LDS R18, 0x0200; (0x0200).
CALL 0x0100(Subroutine address).
here: JMP here.

.ORG 0x0100
LDI R20, 0x30
MOV R19, R18
ANDI R19, 0x0F ---> ADD R19, R20.
STS 0x201, R19.
ADI R18, 0xF0.
SWAP R18. ---> ADD R18, R20.
STS 0x202, R18.
RET.
```