Department of Electronics & Telecommunication Engineering

Experiment No.: FIVE

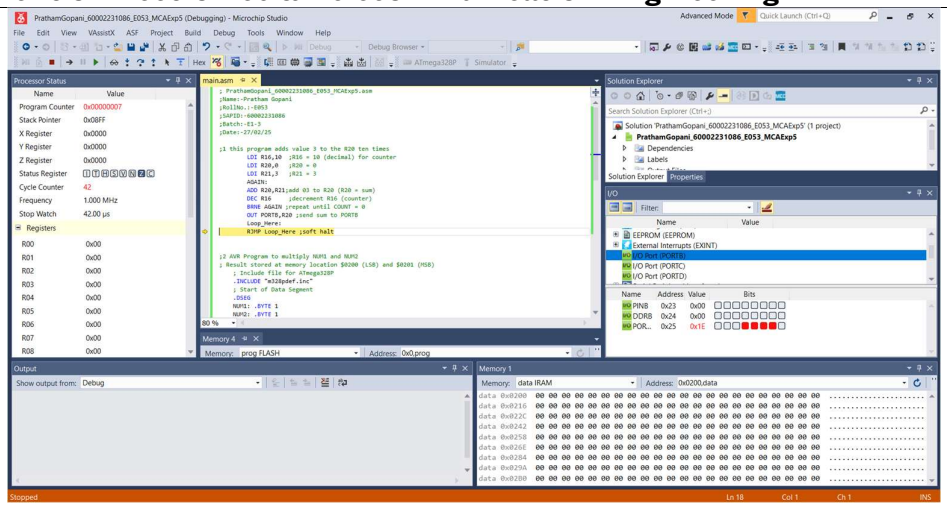
Microcontroller & Applications

Name: **Batch/Rollno:**

SAP ID: **Date:**

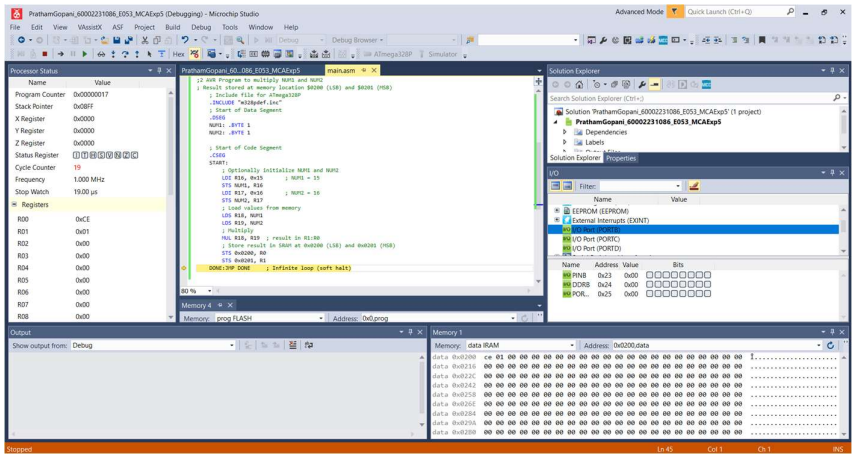
Objective:	Assembly language programming in simulation environment for AVR's microcontroller ATmega328p.
Outcome:	Programs that demonstrate the understanding and use of branching instructions like: BRNE, BRSH etc.
Tasks/Problem Statement:	Students perform the following tasks: • Study and evaluate in simulation mode, an existing code (program) to add numbers multiple times. • Write a program in AVR assembly that multiplies two numbers, NUM1 and NUM2 declared (initialised) using labels. Store results of multiplication in data memory location $200 and $201, LSB followed by MSB. Repeat the program execution using different numbers and verify results of multiplication with actual. Validate the program by using data that considers worst case conditions

Programs, comments, brief explanation and output:	TASK 1:-
	Add Multiple: Study the program below, comment on the logic by observing the register status through simulation.
	; Add_Multiple.asm ;
	; Created: 16/02/2025 17:44:55 ;
	; Author : Admin
	; this program adds value 3 to the R20 ten times
	;.INCLUDE <M32DEF.INC
	LDI R16,10 ;R16 = 10 (decimal) for counter
	LDI R20,0 ;R20 = 0
	LDI R21,3 ;R21 = 3
	AGAIN: ADD R20,R21;add 03 to R20 (R20 = sum)
	DEC R16 ;decrement R16 (counter)
	BRNE AGAIN ;repeat until COUNT = 0
	OUT PORTB,R20 ;send sum to PORTB
	Loop_Here: RJMP Loop_Here ;soft halt

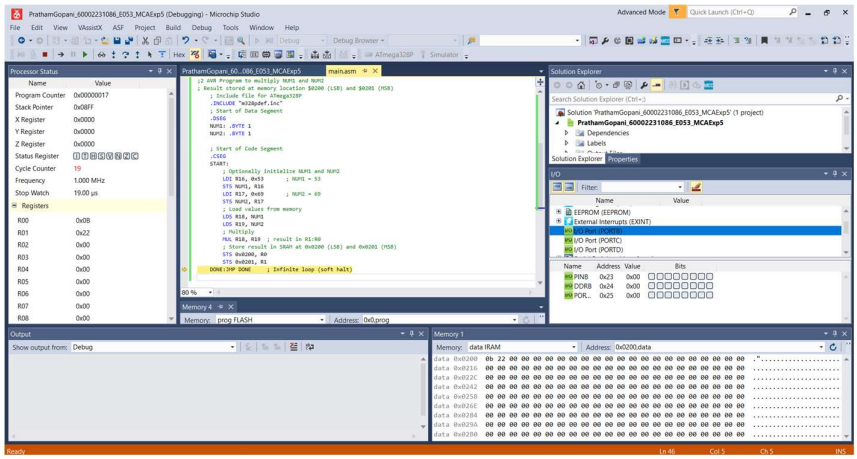


TASK 2:-

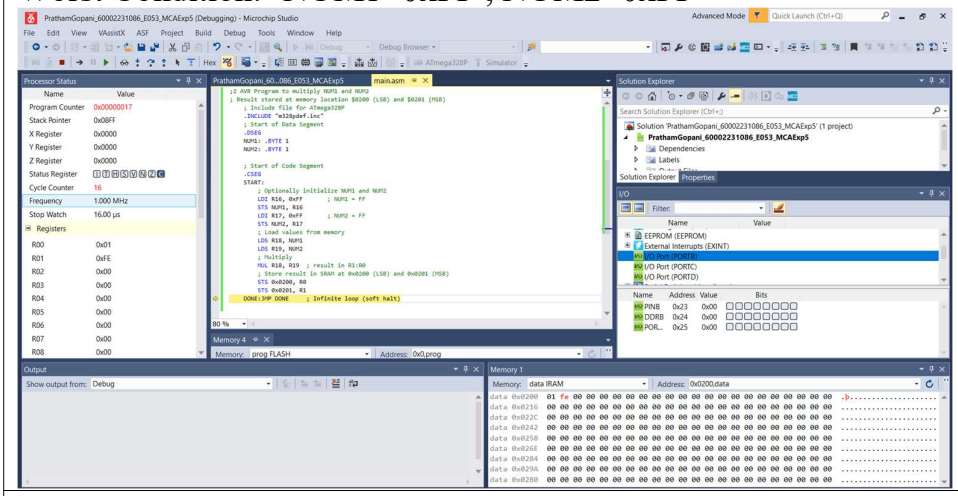
CASE 1:- NUM1 =0X15 & NUM2=0X16



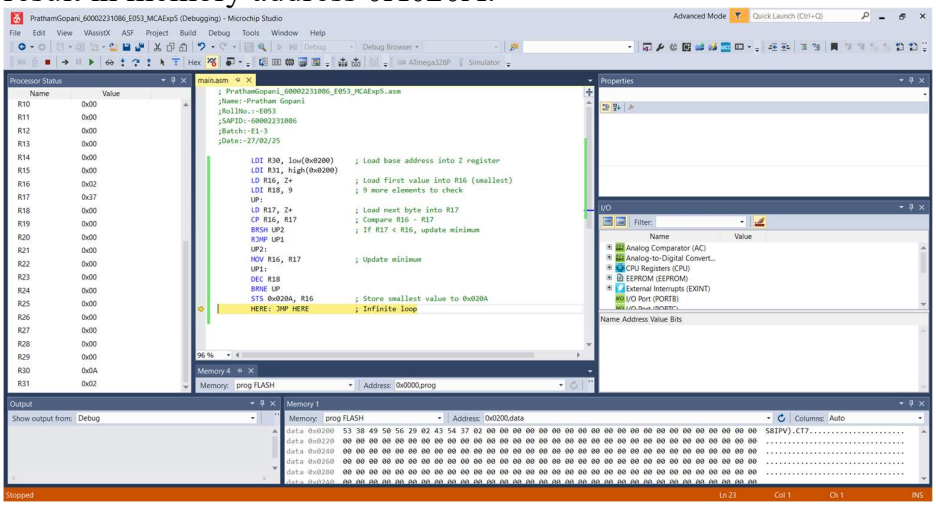
CASE 2:- NUM1=0X53 & NUM2=0X69



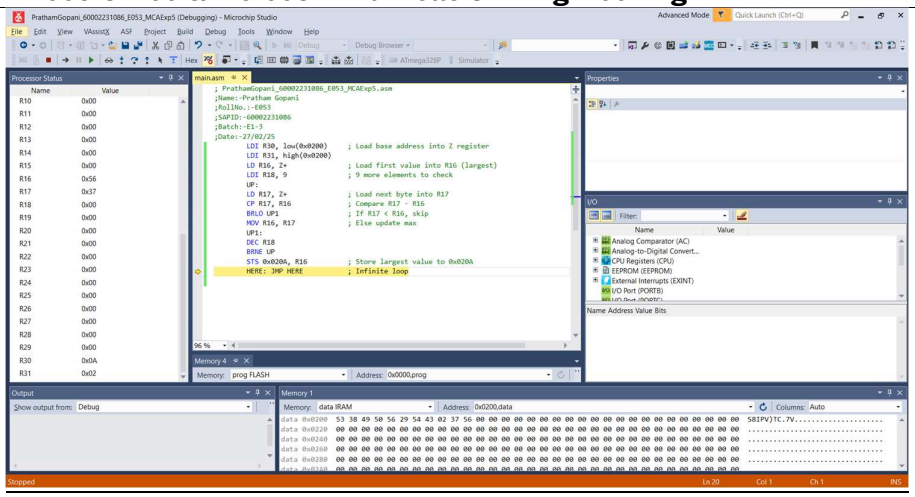
Worst Condition:- NUM1=0xFF , NUM2=0xFF



1. Find the smallest number from a data block of 10 bytes. Data block start from memory address 0X0200 onwards, Store the result in memory address 0X020A.



2. Find the largest number from a data block of 10 bytes. Data block start from memory address 0X0200 onwards, Store the result in memory address 0X020A.



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 demonstrated the use of AVR assembly instructions, especially arithmetic and branching operations like BRNE, BRSH,etc in a simulation environment. It helped deepen the understanding of looping structures, register manipulation, and memory operations. Through practical tasks like repeated addition and multiplication, students effectively learned to validate logic and debug in embedded systems programming.