



SNS COLLEGE OF ENGINEERING

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AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

Fourth Semester

B.E. - Electronics and Communication Engineering

23ECB202-Microcontroller Programming and Interfacing

PUZZLE

UNIT-I

Puzzle 1: The Mystery of the Missing Microcontroller Instructions

Scenario:

You are an embedded systems detective tasked with solving a baffling case involving the PIC16F877A microcontroller. A team of engineers has reported that their program, which was working perfectly yesterday, is now behaving erratically. After some investigation, you discover that certain instructions in the program seem to be "missing" or not executing as expected.

Your task is to solve the mystery by analyzing the following clues:

1. Clue 1: The Program Counter's Path

The Program Counter (PC) is pointing to an unexpected memory address. Could this be due to incorrect branching or stack overflow? Investigate how the PC interacts with the Program ROM space and determine if any instructions are being skipped.

2. Clue 2: The WREG Register's Secret

The WREG register, which temporarily holds data for arithmetic and logic operations, appears to have corrupted values. Could this be due to improper use of instructions like 'MOVWF' or 'ADDWF'? Analyze the sequence of operations involving WREG and identify any potential misuse.

3. Clue 3: The Bank Switching

The engineers report that they were accessing File Registers across different banks. However, some registers seem inaccessible. Could this be due to incorrect bank selection? Examine the role of the STATUS register's RP0 and RP1 bits and determine if the correct bank is being accessed.

4. Clue 4: The Special Function Registers' Role

Certain Special Function Registers (SFRs), such as TRISx and PORTx, are not functioning as expected. Are the engineers using the correct directives and data formats when interacting with these registers? Review the configuration of SFRs and ensure proper initialization.

5. Clue 5: The MPLAB Simulator's Revelation

Using the MPLAB Simulator, you notice discrepancies between the expected and actual behavior of the program. Could this be due to incorrect memory organization or improper use of default access banks? Simulate the program stepbystep to pinpoint the issue.

Using your knowledge of the PIC16F877A architecture, including its block diagram, pin diagram, memory organization, and instruction set, identify the root cause of the problem. Provide a detailed explanation of how the issue occurred and suggest corrective measures to restore the program's functionality.