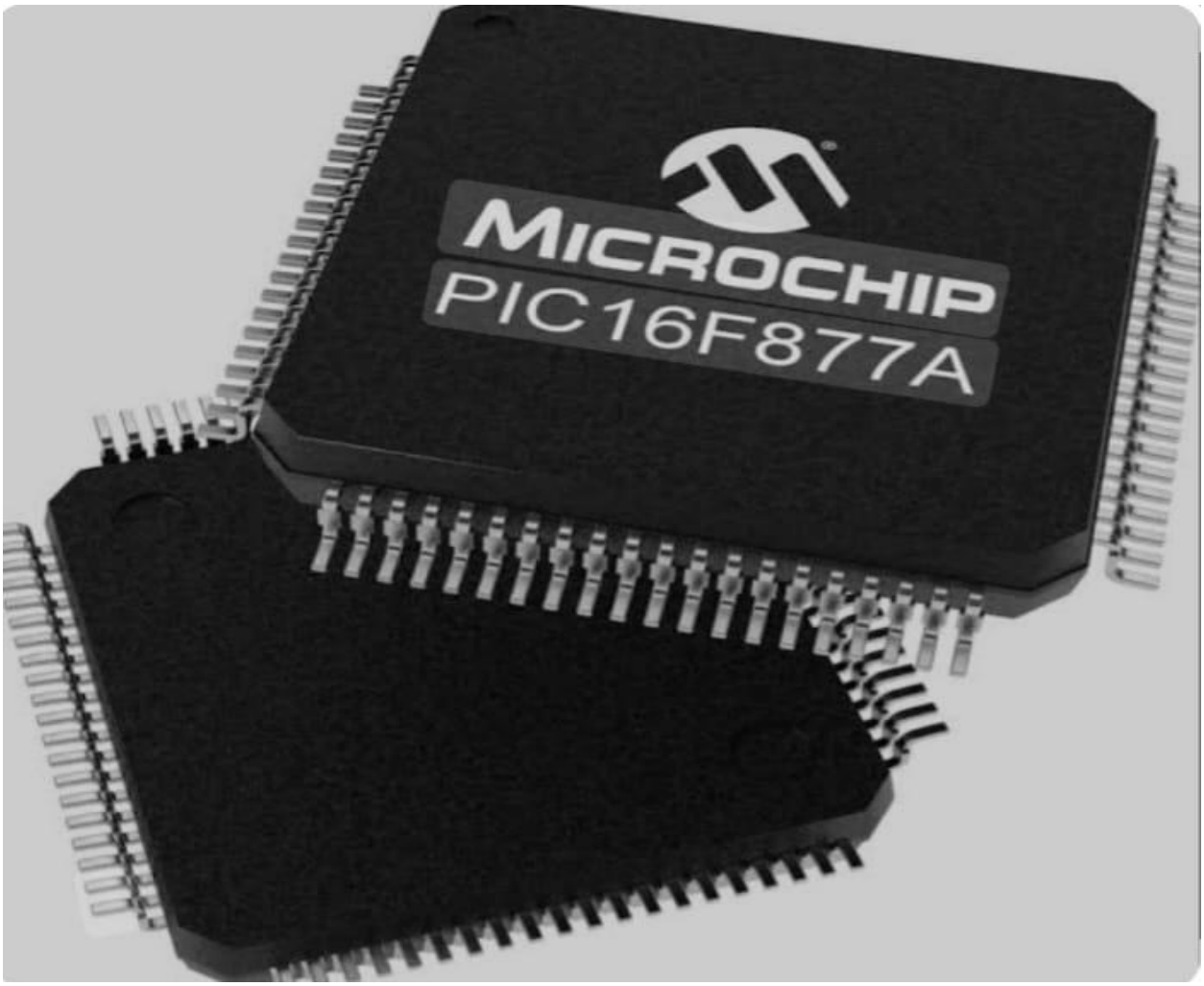


Traffic light

Name: abdulrahman mokhtar mohamed gomma

Sec: 2

B.N:31

A- Describe all the pins of PIC16f877A. After that, your colleagues would have enough information once they need to interface the PIC16f877A with other hardware.

1. Power Supply Pins

- **VDD (pin 11 and 32) :** This is the positive power supply pin. It provides the operating voltage for the microcontroller.
- **VSS (pin 12 and 31) :** This is the ground pin, the common reference point for all voltage levels within the chip.

2. Oscillator Pins

- **OSC1 (pin 13) and OSC2 (pin 14) :** These pins are used for connecting an external crystal or resonator to provide a stable clock source for the microcontroller.

3. Input/Output (I/O) Pins

- **Digital input:** Reading digital signals from external devices (buttons, sensors).
- **Digital output:** Controlling digital devices (LEDs, motors).
- **Analog input:** Reading analog signals (temperature, light intensity).

4. Special Function Pins

These pins have specific functions beyond general I/O:

- **Reset pin (pin 1):** Used to reset the microcontroller.
- **Interrupt pins:** Used to trigger interrupt service routines for specific events.
- **Serial communication pins:** Used for communicating with other devices using protocols like UART, SPI, or I2
- **Timer pins:** Used for input capture, output compare, and PWM functions.
- **Analog-to-Digital Converter (ADC) pins:** Used for converting analog signals to digital values.

Analog Pins on PIC16F877A

- **RA0/AN0**
- **RA1/AN1**
- **RA2/AN2**
- **RA3/AN3**
- **RA5/AN4**
- **RE0/AN5**
- **RE1/AN6**
- **RE2/AN7**

b) Explain to your colleagues the functions of the main blocks in PIC16f877A : ALU, Status and Control, Program Counter, Flash Program Memory, Instruction Register, Instruction Decoder.

1. Arithmetic Logic Unit (ALU)

- The brain of the microcontroller.
- Performs arithmetic and logical operations on data.
- Handles basic calculations like addition, subtraction, AND, OR, XOR, etc.

2. Status and Control Register

- Holds information about the result of arithmetic and logical operations.
- Contains flags like carry, zero, overflow, etc.
- These flags are used for conditional branching and decision-making in the program.

3. Program Counter (PC)

- Keeps track of the memory address of the next instruction to be executed.
- Incremented after each instruction to fetch the next one.
- Can be modified by jump, call, and return instructions for program flow control.

4. Flash Program Memory

- Stores the microcontroller's program instructions.
- Non-volatile memory, meaning data is retained even when power is off.
- Instructions are fetched from here and loaded into the instruction register.

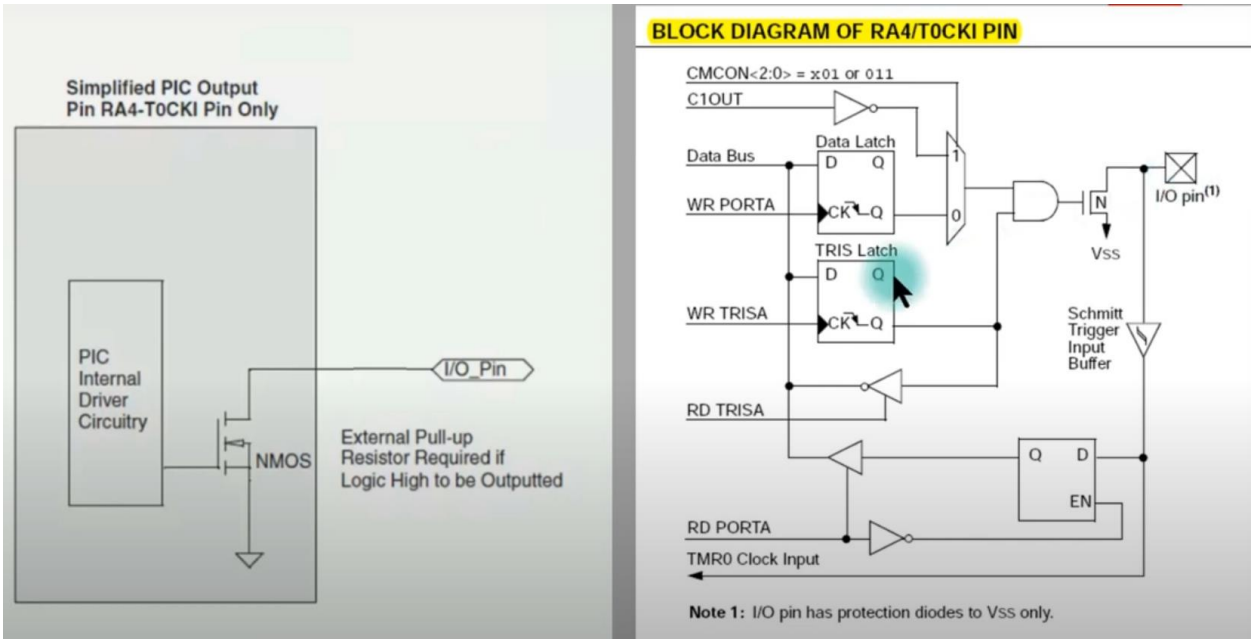
5. Instruction Register (IR)

- Temporarily holds the instruction currently being executed.
- The instruction decoder interprets the contents of the IR.

6. Instruction Decoder

- Decodes the instruction from the IR and generates control signals.
- These control signals coordinate the actions of other components like the ALU, registers, and memory.
- Determines the operation to be performed and the data to be used.

c) Examine the reasons why a led, which is connected to RA4 for flashing prepose not working probably



Because it differs from the rest of the pins in that it contains one transistor (NMOS) that work when zero is connected to it, When ra4 is a source, the LED does not work because when there is zero on the transistor there is no voltage difference and when there is 1 on the transistor it is an open circuit but it works when ra4 is a sink.

d) ATMega328P [2] is also an 8-bit but AVR microcontroller. Evaluate the characteristics of ATMega328P versus PIC16f877A, by comparing the memory size, the power consumption, pin count... of those two MCUs. Give 2 examples of embedded systems where ATMega328P is a better choice than PIC16f877A.

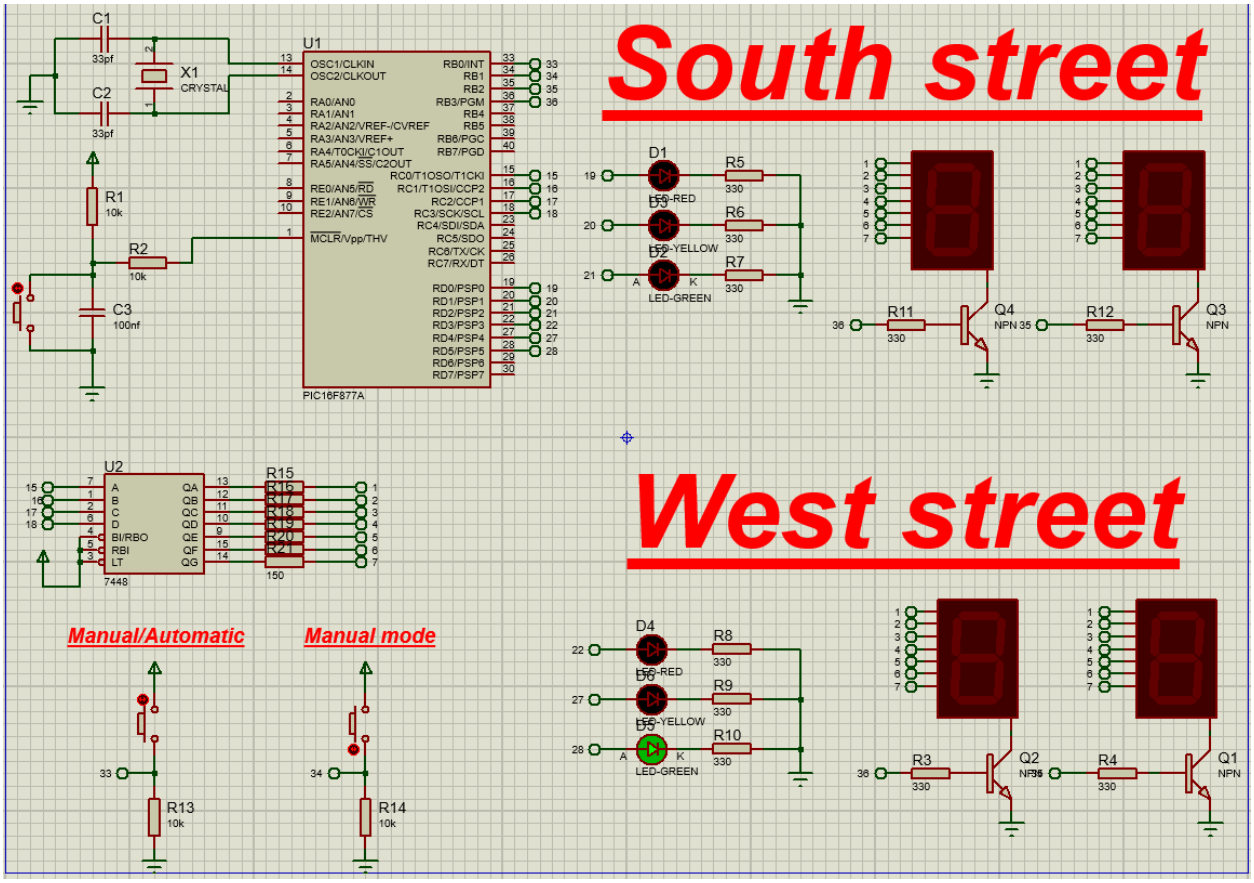
Both the ATmega328P and PIC16F877A are popular 8-bit microcontrollers, but they exhibit distinct characteristics that make them suitable for different applications. Let's compare key parameters:

Feature	**ATmega328P**	**PIC16F877A**
Flash Memory	32 KB	8 KB
SRAM	2 KB	368 bytes
EEPROM	1 KB	256 bytes
Pin Count	28	40
Feature	**ATmega328P**	**PIC16F877A**
Timers	3 (16-bit, 8-bit, 8-bit)	3 (16-bit, 8-bit, 8-bit)
Power Consumption	Low to moderate	Moderate

the ATmega328P generally offers more resources and flexibility, making it a better choice for applications that require:

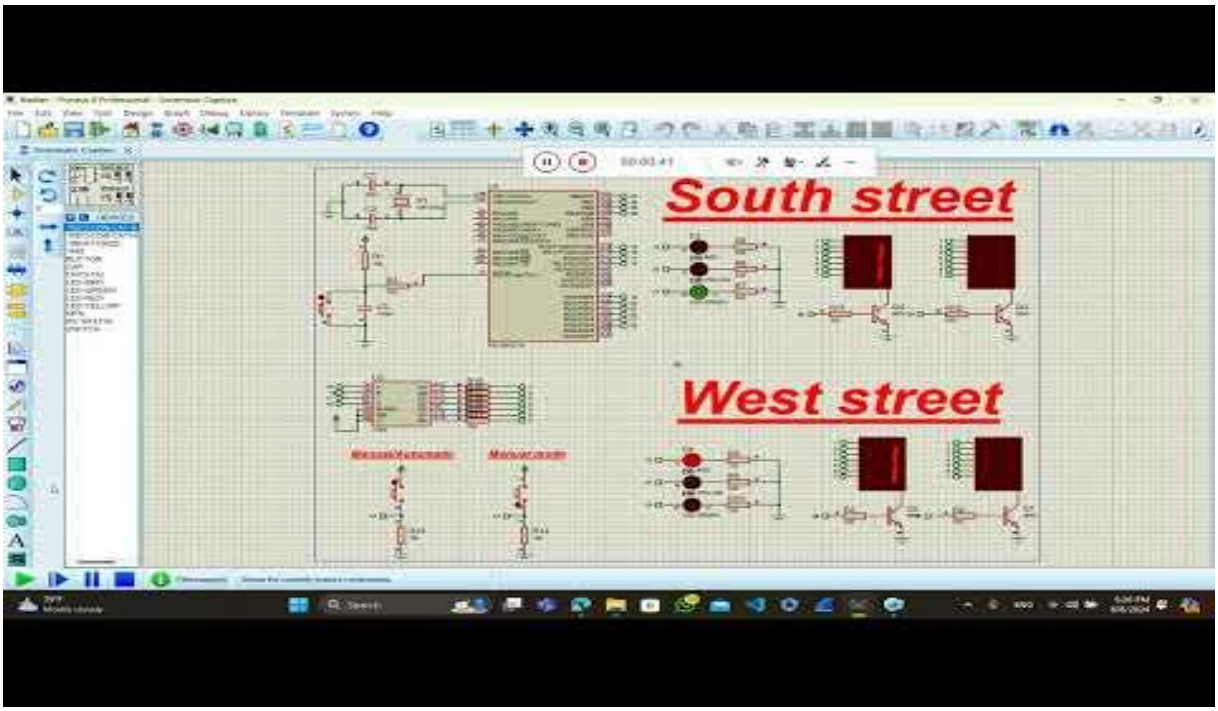
- Larger code size and data storage
- More complex algorithms and processing
- Lower power consumption

SChematic



Youtube link

https://youtu.be/v5b15gGgCpI


South street
West street