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B.N : 58

Project Report

Task1 :

a)

- OSC1/CLKI OSC1 : Oscillator crystal or external clock input.
- OSC2/CLKO : Oscillator crystal or clock output.
- MCLR/VPP : Master Clear (input) or programming voltage (output).
- RA0/AN0 , RA1/AN1 , RA2/AN2 , RA3/AN3 : Digital I/O & Analog Input.
- RA4/T0CKI/C1OUT : Digital I/O & Timer & Comparator.
- RA5/AN4/SS/C2OUT : Digital I/O & Analog Input & Comparator.
- RB0/INT : Digital I/O & External Interrupt.
- RB1 , RB2 , RB3 , RB4 , RB5 , RB6, RB7 : Digital I/O.
- RC0/T1OSO/T1CKI : Digital I/O & Timer.
- RC1/T1OSI/CCP2 : Digital I/O & Timer.
- RC2 , RC3 , RC4 , RC5 , RC6 , RC7 : Digital I/O.
- VSS : Ground reference for logic and I/O pins.
- VDD : Positive supply for logic and I/O pins.
- Port D : All Pin are Digital I/O.
- RE0/RD/AN5 : Digital I/O & Analog Input .
- RE1/WR/AN6 : Digital I/O & Analog Input .
  RE2/CS/AN7 : Digital I/O & Analog Input .

b)

- **ALU (Arithmetic Logic Unit):** central arithmetic and logic processing unit of the microcontroller. It performs arithmetic operations (such as addition, subtraction) and logic operations (such as AND, OR, XOR) on binary data.
- **Status and Control Registers:** are special registers that store flags and control bits related to the microcontroller's current state. These flags indicate the outcomes of previous operations, such as carry, zero, overflow, and more.
- **Program Counter (PC):** is a register that holds the address of the next instruction to be fetched and executed in the program memory.

- **Flash Program Memory:** is the non-volatile memory of the microcontroller, where the program code (firmware) is stored.
- **Instruction Register:** is a temporary storage unit within the microcontroller that holds the current instruction being executed.
- **Instruction Decoder:** is responsible for interpreting the instruction fetched from the program memory and determining the operation that needs to be performed by the ALU or other peripherals.

c) Because It must Supplied by Sink.

d)

Memory Size:

- ATMega328P: It has 32KB of flash memory for program storage, 2KB of SRAM for data storage, and 1KB of EEPROM for non-volatile data storage.
- PIC16F877A: It has 14KB of flash memory for program storage, 368 bytes of RAM for data storage, and no built-in EEPROM.

The ATMega328P has more flash memory and RAM than the PIC16F877A, making it more suitable for applications that require larger code and data storage.

Power Consumption:

- ATMega328P: It is based on the low-power RISC architecture and has various power-saving modes, which allows it to achieve lower power consumption in many scenarios.
- PIC16F877A: While it can be power-efficient in some applications, it may not offer as many low-power features and modes as the ATMega328P.

The ATMega328P is generally considered more power-efficient, making it a better choice for battery-operated and power-constrained embedded systems.

Pin Count:

- ATMega328P: It comes in various package options, including 28-pin and 32-pin versions.
- PIC16F877A: It has 40 pins.

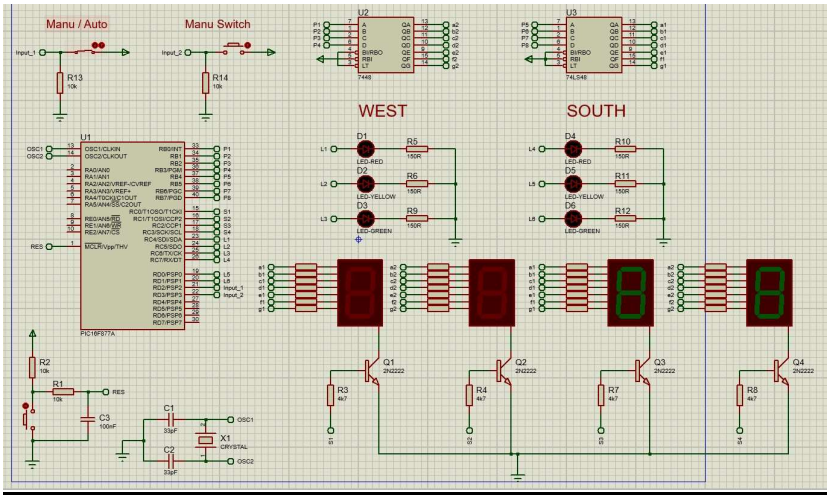
The ATMega328P is available in smaller package options with fewer pins, making it a suitable choice for applications with space constraints or simpler designs.

Examples of embedded systems where ATMega328P is a better choice than PIC16F877A:

Portable IoT Sensor Node: An IoT sensor node designed to operate on batteries and transmit sensor data to a central server or gateway. The ATMega328P's lower power consumption and ample flash memory would be advantageous for storing sensor data, implementing various communication protocols, and ensuring longer battery life compared to the PIC16F877A.

Task 2 :

a)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Manu Switch
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SOUTH
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U2
U3
D1
D2
D3
D4
D5
D6
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Q2
Q3
Q4
R1
R2
R3
R4
R5
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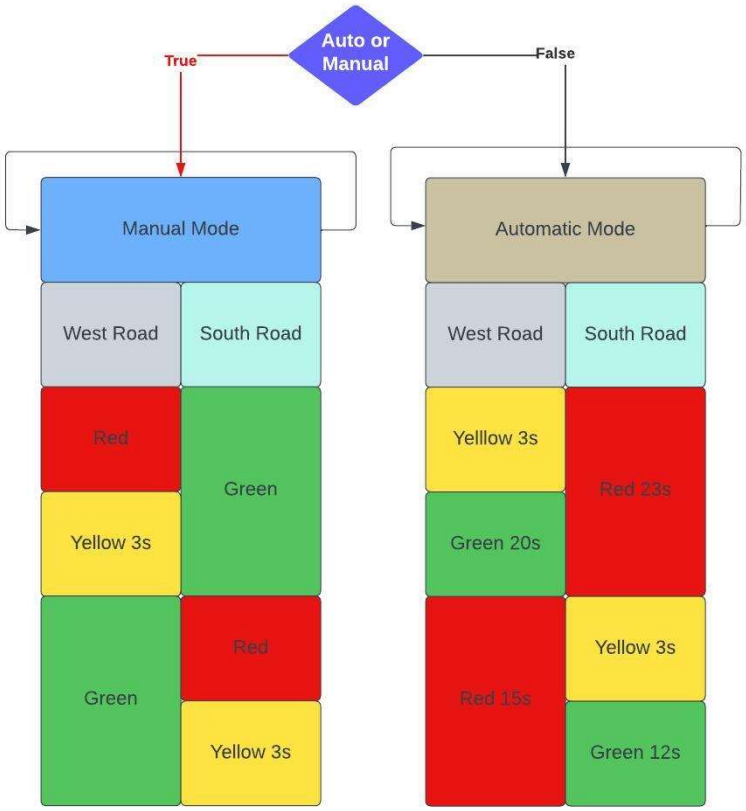
R7
R8
R9
R10
R11
R12
R13
R14
C1
C2
C3
X1

b)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South Road
Red
Green
Yellow 3s
Green
Red
Yellow 3s
Automatic Mode
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South Road
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Red 23s
Green 20s
Red 15s
Yellow 3s
Green 12s