Final Project

Embedded Systems

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Microcontroller PIC16F877a

Task 1:

What is PIC16F877a?

PIC16F877a is a PIC Microcontroller and is normally used in Embedded Projects like Home Automation System, Bank Security System etc.

How many pins does PIC16F877a have?

It has a total number of 40 pins and there are 33 pins for input and output. PIC16F877A is used in many pic microcontroller projects. PIC16F877A also have many application in digital electronics circuits. PIC16f877a finds its applications in a huge number of devices.

What is the Use of PIC16F877a?

PIC16F877a is used in many pic microcontroller projects. PIC16F877a also have much application in digital electronics circuits. PIC16f877a finds its applications in a huge number of devices. It is used in remote sensors, security and safety devices, home automation and many industrial instruments

PIC16F877a Pinout

Pins :

Pin Number	Pin Name	Description
1	MCLR/Vpp	MCLR is used during programming, mostly connected to programmer like PicKit
2	RA0/AN0	Analog pin 0 or 0th pin of PORTA
3	RA1/AN1	Analog pin 1 or 1st pin of PORTA
4	RA2/AN2/Vref-	Analog pin 2 or 2nd pin of PORTA
5	RA3/AN3/Vref+	Analog pin 3 or 3rd pin of PORTA
6	RA4/T0CKI/C1out	4th pin of PORTA
7	RA5/AN4/SS/C2out	Analog pin 4 or 5th pin of PORTA
8	RE0/RD/AN5	Analog pin 5 or 0th pin of PORTE
9	RE1/WR/AN6	Analog pin 6 or 1st pin of PORTE
10	RE2/CS/AN7	7th pin of PORTE
11	Vdd	Ground pin of MCU
12	Vss	Positive pin of MCU (+5V)
13	OSC1/CLKI	External Oscillator/clock input pin
14	OSC2/CLKO	External Oscillator/clock output pin
15	RC0/T1OSO/T1CKI	0th pin of PORT C
16	RC1/T1OSI/CCP2	1st pin of POCTC or Timer/PWM pin

17	RC2/CCP1	2nd pin of POCTC or Timer/PWM pin
18	RC3/SCK/SCL	3rd pin of POCTC
19	RD0/PSP0	0th pin of POCTD
20	RD1/PSPI	1st pin of POCTD
21	RD2/PSP2	2nd pin of POCTD
22	RD3/PSP3	3rd pin of POCTD
23	RC4/SDI/SDA	4th pin of POCTC or Serial Data in pin
24	RC5/SDO	5th pin of POCTC or Serial Data Out pin
25	RC6/Tx/CK	6th pin of POCTC or Transmitter pin of Microcontroller
26	RC7/Rx/DT	7th pin of POCTC or Receiver pin of Microcontroller
27	RD4/PSP4	4th pin of POCTD
28	RD5/PSP5	5th pin of POCTD
29	RD6/PSP6	6th pin of POCTD
30	RD7/PSP7	7th pin of POCTD
31	Vss	Positive pin of MCU (+5V)
32	Vdd	Ground pin of MCU
33	RB0/INT	0th pin of POCTB or External Interrupt pin

34	RB1	1st pin of POCTB
35	RB2	2nd pin of POCTB
36	RB3/PGM	3rd pin of POCTB or connected to programmer
37	RB4	4th pin of POCTB
38	RB5	5th pin of POCTB
39	RB6/PGC	6th pin of POCTB or connected to programmer
40	RB7/PGD	7th pin of POCTB or connected to programmer

ALU :

What is an arithmetic-logic unit (ALU)?

An arithmetic-logic unit is the part of a central processing unit that carries out arithmetic and logic operations on the operands in computer instruction words.

The STATUS register: is of most importance to programming the PIC, it contains the arithmetic status of the ALU (Arithmetic Logic Unit), the RESET status and the bank select bit for data memory. As with any register, the STATUS register can be the destination for any instruction.

The control bus:

transmits the operational signal between the CPU and system components such as the read and write signals, system clock signal, and system interrupts. Finally, clock/counter/timer signals are used in a microcontroller to synchro- nize operations among components.

Program memory: The program written by the user is stored in this memory.

The **program counter** then executes the commands one by one**.**

Program memory can have three types of memories:

1. ROM
2. EPROM
3. Flash EEPROM

instruction Register && instruction decoder:

To execute an instruction, the processor copies the instruction code from the program memory into the **instruction register** (IR). It can then be decoded (interpreted) by the **instruction decoder**, which is a combinational logic block which sets up the processor control lines as required.

Examine the reasons why a led, which is connected to RA4 for flashing purpose not working probably ?

RA4 on that microcontroller is an open drain output. This means that when you set it as low, the output will be low; but when you set it high the output will be tristated (high impedance). You will need to change your LED configuration to turn it on with an open drain.

	PIC16F877A	**ATMega328P**
memory size(KB)	**14**	**32**
power consumption (mw)	**0.5**	**0.5**
Pin count(Pins)	**40**	**28**

Note/ Most of the embedded systems like IoT based uses ATmega328 to perform multiple kinds of operations due to its vast examples and helping material on the internet.

Some apps where ATmega328P is used :

- Industrial equipment control
- Motor control
- Switch mode power systems
- Commercial product embedded systems
- Digital processing
- Analog signal acquisition and processing
- Display devices