

Solution TUTORIAL 2 (Embedded Systems EEE60603)

March 2017

1.

(i). In how many ways can you write the hex number 1F?

Answer: 1FH, 0x1F, 1Fh, 0X1F

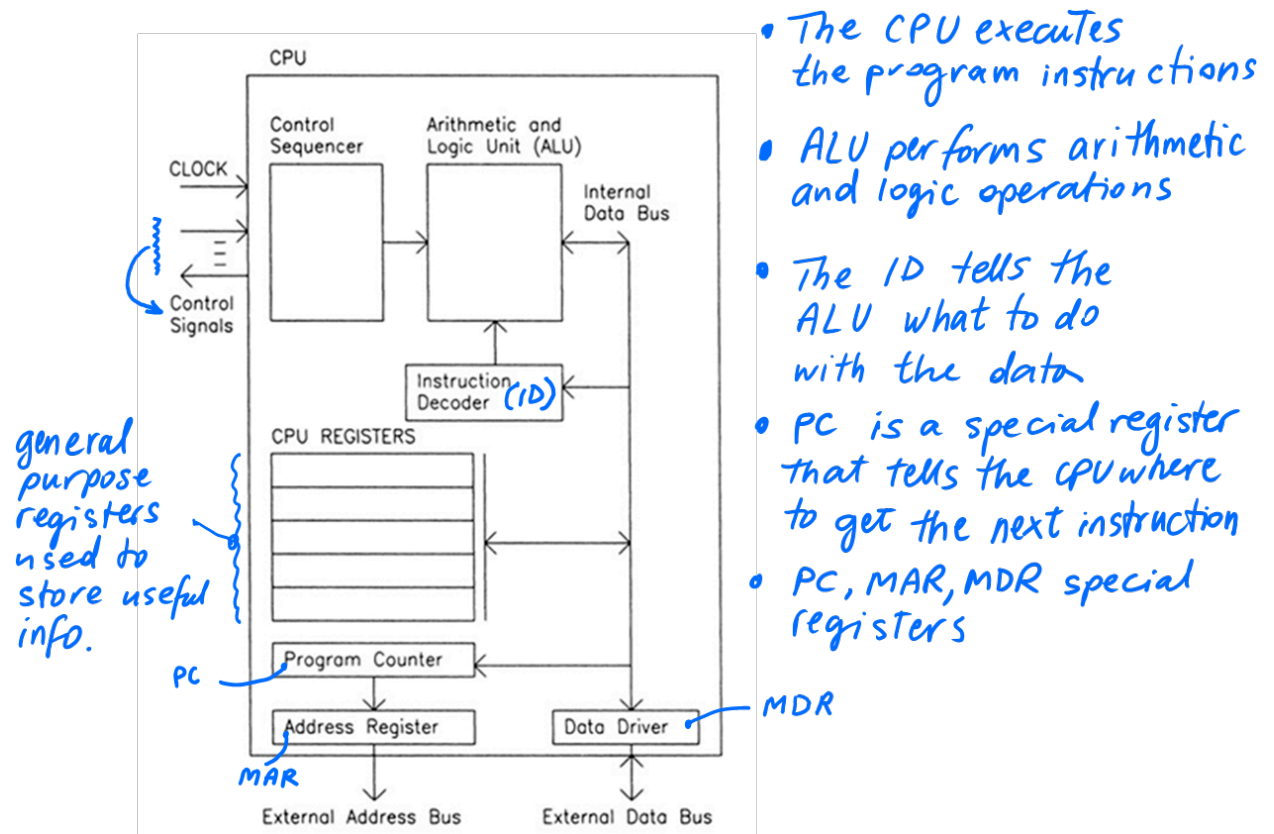
(ii). Name the main components of a generic microcontroller and explain their functions.

Answer:

- On-chip RAM (data) and ROM (program)
- Support external program and data memory
- I/O ports for direct interfacing with other digital devices
- On-chip timer/counter
- Parallel and serial communication capabilities
- Interrupt from external stimuli

(iii) Describe the role of ALU, Instruction Decoder (ID), PC, and Registers in a generic CPU?

Answer:



(iv). How are the instructions run in CPU?

Answer:

- Program (instructions) and Data are stored in Memory
- Each instruction is read (fetched) from memory, interpreted (decoded), and executed
- Arithmetic Logic Unit (ALU) performs operations on data
- Data is transferred (register, memory, I/O)
- Program Counter (PC) indicates current location of program in Memory and is automatically incremented after each instruction.

v) What is the role of Stack in a microcontroller?

Answer: Stack stores the address of the PC when a subroutine is called

vi) Describe the roles of WREG and SFR registers in PIC microcontrollers.

Answers

WREG- Temporary Register in ALU

SFR – For implementing the various features of the microcontroller

2. Based on the lecture two slide number 33, find the following in PIC16F84 Program memory

a. Bit length of Program counter.

Answer: 13

b. Depth of Stack

Answer: 8

c. Reset Vector address

Answer: 0000h

d. Interrupt Vector Address

Answer: 0000h

e. The size of Program Memory

Answer: 0000h to 1FFFh

3. Based on the lecture two slide number 34 find the following in PIC16F84 Data memory

a. Address of TMR0 ---> 01h

b. Address of PORTA ---> 05h

c. Address of TRISA --> 85h

d. Identify the bank of TRISB and PORTB --> 1 and 0

e. The range of GPR registers --> 0Ch to 4Fh

f. Address bit width. --> 8

4. Download PIC16F877 and PIC18F452 Datasheets and find 3 differences between them.

1) Flash (8KB) and enhanced Flash (32KB)

2) RAM 368B and 768B

3) Instructions 35 and 75

5. Identify the addressing modes for the following assembly language statements.

- i) MOVLW 0X55 -->Immediate Addressing

- ii) CLRF TRISB
 MOVWF PORTB -->Direct Addressing

- iii) MYREG EQU 0X37
 MOVWF MYREG --> Direct Addressing

- iv) MOVLB 0X05 --> Immediate Addressing

- v) BSF STATUS, IRP
 MOVLW 0x20
 MOVWF FSR -->Indirect Addressing
 CLRF INDF