

XMUT202 Digital Electronics

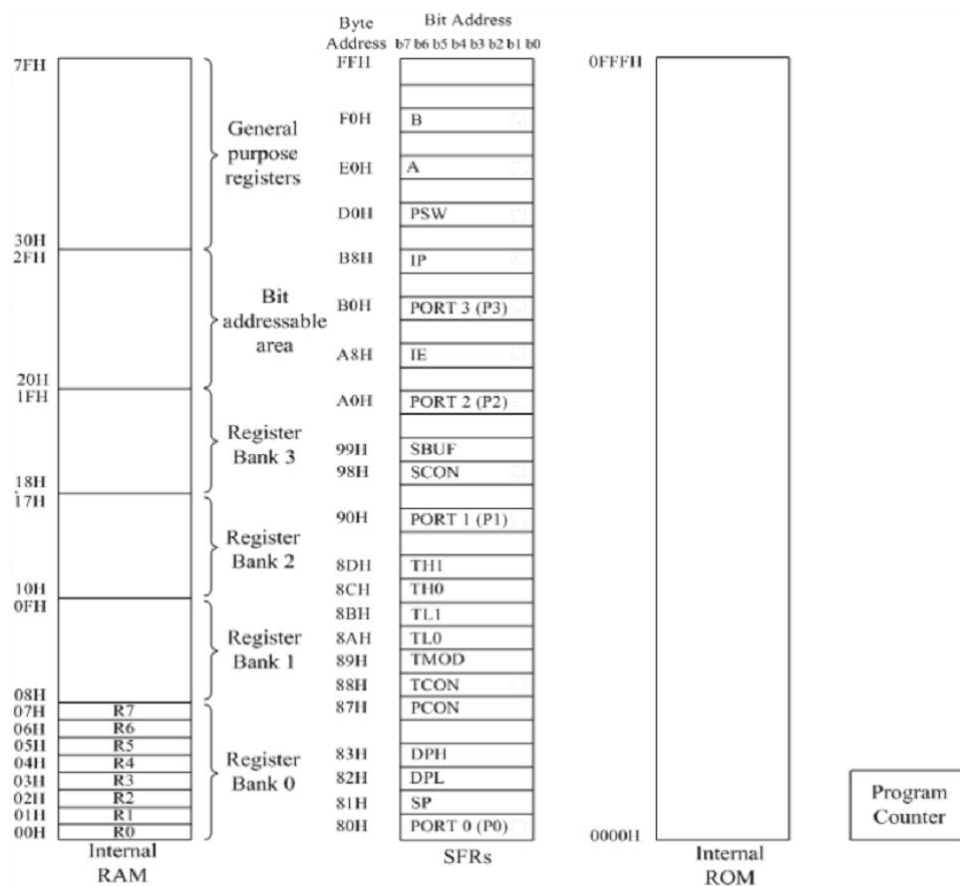
Tutorial 3: Assembly Language

A. Assembly Language

1. With regard to high-level and low-level programming languages, answer the following questions
 - a. What are these programming languages? [2 marks]
 - b. Provide at least two examples of these programming languages? [2 marks]
 - c. What are the advantages and disadvantages of one to the other? [2 marks]

2. Compare the characteristics of CISC and RISC of the instruction set of the microprocessor. [2 marks]

3. The diagram below shows the mapping of the register memory locations in the 8051 microcontrollers.



Which of the registers given above are:

a. Byte addressable. [2 marks]

b. Bit addressable. [2 marks]

4. What is the size of the following registers in the 8051 microcontrollers. [4 marks]

a. Accumulator (A).

b. Program Counter (PC).

c. Data Pointer (DTPR).

d. Stack Pointer (SP).

5. Describe the addressing mode of the following instructions in the 8051 microcontrollers. [4 marks]

Instruction	Addressing Mode
MOV A, B	
MOV 30H, A	
ADD A, @R0	
ADD A, #80H	

6. Describe at least two examples of bit-addressing instruction sets in the 8051 microcontrollers. [2 marks]

B. Programming with Basic Assembly Language

B.1. Memory Addressing Instructions

1. Describe the following assembly language program for immediate addressing mode program in the 8051 microcontrollers. [2 marks]

Program:

```
ADD A, #030H
```

2. Describe the following assembly language program for register addressing mode program in the 8051 microcontrollers. [2 marks]

Program:

```
MOV A, P3
```

3. Describe the following assembly language program for direct addressing mode program in the 8051 microcontrollers. [2 marks]

Program:

```
MOV A, 020H
```

4. Describe the following assembly language program for indirect addressing mode program in the 8051 microcontrollers. [2 marks]

Program:

```
MOV @R0, A
```

5. Describe the following assembly language program for indirect addressing mode program from a 16-bit data pointer register (DPTR) to Accumulator A in the 8051 microcontrollers. [2 marks]

Program:

```
MOVX A, @DPTR
```

6. Describe the following assembly language program for immediate addressing mode program to a 16-bit data pointer register (DPTR) in the 8051 microcontrollers. [2 marks]

Program:

```
MOV DPTR, #0FE00H
```

7. Describe the following assembly language program for addressing mode program in the 8051 microcontrollers. [2 marks]

Program:

```
GoBack: DEC A
        JNZ GoBack
```

8. Describe the following assembly language program for addressing mode program in the 8051 microcontrollers. What is the scope of ACALL for switching the instruction. [2 marks]

Program:

```
ACALL    PORT_INIT
        NOP
        NOP
```

```

                                NOP
PORT_INIT:                      MOV P0, #0FH

```

9. Describe the following assembly language program for addressing mode program in the 8051 microcontrollers. What is the equivalent function in C programming language. [2 marks]

Program:

```

                                LCALL TIMER_INIT
                                NOP
                                NOP
TIMER_INIT:                      ORL TMOD, #01H

```

B.2. Bit-Addressing Instructions

10. Describe the following assembly language program for the bit rotating op code-based program in the 8051 microcontrollers. [2 marks]

Program:

```

MOV A, #11000011B
RL A
RR A

```

11. Describe the following assembly language program for the bit rotating op-code with carry-based program in the 8051 microcontrollers. [4 marks]

Program:

```

MOV A, #11000011B
RLC A
RLC A
RRC A
RRC A

```

12. Describe the following assembly language program for bit setting, clearing and complementing program in the 8051 microcontrollers. [3 marks]

Program:

```

MOV P1, #10101111B
SETB P1.6
CLR P1.2

```

CPL P1.0

13. Describe the following assembly language program for bit swapping program in the 8051 microcontrollers. [1 mark]

Program:

```
MOV A, 11111010B
SWAP A
```

14. Describe the following assembly language program for AND and OR bit masking program in the 8051 microcontrollers. [5 marks]

Program:

```
MOV P2, #10101111B
ANL C, P2.0
ORL C, P2.7
ANL P2.6, C
ANL P1, #00000001B
ORL P1, #00000010B
```

15. Describe the following assembly language program for bit conditional branching-based program in the 8051 microcontrollers. [6 marks]

Program:

```
MOV A, #80H
RLC A
JC LOOP
JNC LOOP
LOOP: JB P0.2, LOOP
      JNB P1.4, LOOP
      JBC P0.2, LOOP
```