جامعة المنارة

كلية: .....الهندسة.....

قسم: .....المعلوماتية.....

اسم المقرر: .....بنيان الحاسوب 1.....

رقم الجلسة (4)

عنوان الجلسة

ترميز تعليمات القفز

الفصل الدراسي **الثاني** **العام الدراسي** **2022-2023**

جدول المحتويات

Contents

الغاية من الجلسة:

---------تعليم الطالب استخلاص ترميز التعليمة البرمجية في المعالج 8086----------

مقدمة:

Unconditional Jump Instructions

- The conditional jump is a jump in which control is transferred to the target location if it meets the required condition.
  - DJNZ, JZ, JNC...
- The unconditional jump is a jump in which control is transferred unconditionally to the target location.
- There are two unconditional jumps :
  - LJMP (Long Jump)
  - SJMP (Short Jump)
  - Example 3-6 ~ 3-7

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Long Jump (LJMP)

- a 3-byte instruction
  - The first byte is the opcode
  - The next two bytes are the target address (real address)
- LJMP is used to jump to any address location within the 64K byte code space of the 8051.

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LJMP

- Jump to a new address

  LJMP 16-bit-target-addr.

```
Line   PC      Opcode      Mnemonic  Operand
17     0015    020015     HERE:     LJMP   HERE
18     0018                         END
```

  - The opcode of LJMP is 02.
  - When executing Line 17, jump to the target address 0015H.
  - The 8051 Assembler can transfer the label "HERE" to the value 0015H.

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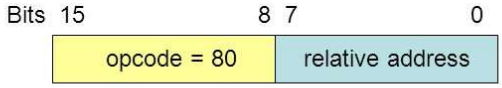
Short Jump (SJMP)

- a 2-byte instruction
  - The first byte is the opcode
  - The second byte is the signed number displacement, which is added to the PC to get the target address.
  - The target address must be within -128 to +127 bytes of the PC from the program counter.
  - The address is referred to as a *relative address* since the target address is -128 to 127 bytes relative to the PC.



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SJMP

- Jump to a new address

  SJMP 8-bit-relative-address

```
Line   PC      Opcode      Mnemonic  Operand
17     0015    80FE       HERE:     SJMP   HERE
18     0017                         END
```

  - Then opcode of "SJMP" is 80.
  - The target label HERE has the value 0015H.
  - PC=0017H.
  - The relative address is 0015H-0017H=FEH The target address is PC+the relative address=0017H+FEH (The CARRY is dropped of the low byte)

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Example 3-6 (1)

Using the following list file, verify the jump forward address calculation.

```
Line  PC     Opcode          Mnemonic  Operand
01    0000                   ORG       0000
02    0000   7800            MOV       R0,#0
03    0002   7455            MOV       A,#55H
04    0004   6003            JZ        NEXT
05    0006   08              INC       R0
06    0007   04      AGAIN:  INC       A
07    0008   04              INC       A
08    0009   2477    NEXT:   ADD       A,#77H
09    000B   5005            JNC       OVER
10    000D   E4              CLR       A
11    000E   F8              MOV       R0,A
12    000F   F9              MOV       R1,A
13    0010   FA              MOV       R2,A
14    0011   FB              MOV       R3,A
15    0012   2B      OVER:   ADD       A,R3
16    0013   50F2            JNC       AGAIN
17    0015   80FE    HERE:   SJMP      HERE
18    0017                   END
```

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Example 3-6 (2)

Solution:

The target address > PC ⇒ jump forward

```
JZ NEXT
```

Opcode=60; the target address=NEXT=0009H; PC=0006H

The relative address

= the target address - PC = 0009 - 0006 = 0003

```
JNC OVER
```

Opcode=05; the target address=OVER=0012H; PC=000DH

The relative address

= the target address - PC = 0012 - 000D = 0005

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Example 3-7

Verify the calculation of backward jumps in Example 3-6.

Solution:

The target address < PC ⇒ jump backward

```
JNC AGAIN
```

Opcode=50; the target address=AGAIN=0007H; PC=0015H

The relative address

= the target address - PC = 0007 - 0015 = -14=F2H

The target address = 0015H + F2H = 0007H

```
SJMP HERE
```

Opcode=80; the target address=HERE=0015H; PC=0017H

The relative address

= the target address - PC = 0015 - 0017 = -2=FEH

The target address=PC+ FEH=0017H+FEH=0015H

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Table 3-1: 8051 Conditional Jump Instructions

Instruction	Action
JZ (Jump Zero)	Jump if A=0
JNZ (Jump no zero)	Jump if A≠0
DJNZ Rn,target	Decrement and jump if byte≠0
CJNE A,byte	Compare A with byte and jump if not equal (A≠byte)
CJNE reg,#data	Compare reg. with #data and jump if not equal (byte ≠ #data)
JC (Jump carry)	Jump if CY=1
JNC (Jump no carry)	Jump if CY=0
JB (Jump bit)	Jump if bit=1
JNB (Jump no bit)	Jump if bit=0
JBC (jump bi clear bit)	Jump if bit=1 and clear bit

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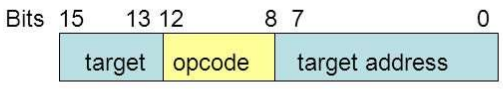
Other Unconditional Jump

- JMP @A+DPTR
  - discuss later
- Absolute jump (AJMP)

  AJMP 11-bit-target-address
  - The target address must be within 2K bytes of program memory.



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