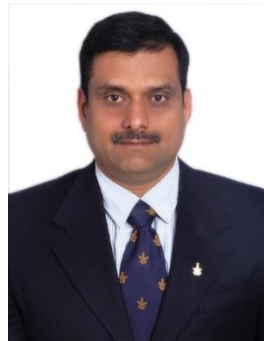




MPI Tutorial-8

8086 Branching Operations

By Dr. Sanjay Vidhyadharan



Problem-1

Indicate the OP and the IP after the jump instruction is executed.

Address	Instruction
0100	JMP 0105
0152	JMP 0177
0173	JMP 01BC
0200	JMP 0281

Problem-1

Indicate the OP and the IP after the jump instruction is executed.

Solution:

Address	Instruction	Code	Final IP
0100	JMP 0105	EB 03	$100h + 2 + 03h = 105h$
0152	JMP 0177	EB 23	$152h + 2 + 23h = 177h$
0173	JMP 01BC	EB 47	$173h + 2 + 47h = 1BCh$
0200	JMP 0281	EB 7F	$200h + 2 + 7Fh = 281h$

JMP = Unconditional Jump:

Direct Within Segment	11101001	disp-low	disp-high
Direct Within Segment-short	11101011	disp	
Indirect Within Segment	11111111	mod 100 r/m	
Direct Intersegment	11101010	offset-low	offset-high
		seg-low	seg-high
Indirect Intersegment	11111111	mod 101 r/m	

Problem-2

Indicate the OP and the IP after the jump instruction is executed.

Address	Instruction
0147	JMP 0145
0152	JMP 012B
0173	JMP 0124
0200	JMP 0182

Problem-2

Indicate the OP and the IP after the jump instruction is executed.

Solution:

Address	Instruction	Code	Two's (2's) Complement	Formula Examples
0147	JMP 0145	EB FC	-4	$147h + 2 + (-4) = 145h$
0152	JMP 012B	EB D7	-29h (-41)	$152h + 2 + (-29h) = 12Bh$
0173	JMP 0124	EB AF	-51h (-81)	$173h + 2 + (-51h) = 124h$
0200	JMP 0182	EB 80	-80h (-128)	$200h + 2 + (-80h) = 182h$

4 0000 0100
 -4 1111 1011+1
 1111 1100
 FC

Problem-3

Write the Op-code and Assembly language code for the Program given below:

```
AGAIN:  :
        ADD AL,[BX]      1067:000D
        INC BX           1067:000F
        DEC CX           1067:0010
        JNZ AGAIN        1067:0011
        MOV SUM,AL       1067:0013
```

Problem-3

Write the Op-code and Assembly language code for the Program given below:

Solution:

AGAIN:	:	:	:
ADD AL,[BX]	:	1067:000D 0207	ADD AL,[BX]
INC BX	:	1067:000F 43	INC BX
DEC CX	:	1067:0010 49	DEC CX
JNZ AGAIN	:	1067:0011 75FA	JNZ 000D
MOV SUM,AL	:	1067: <u>0013</u> A20500	MOV [0005],AL
:	:	:	:

The instruction “JNZ AGAIN” is assembled as “JNZ 000D” and the 000Dis the address of the instruction with label AGAIN. •(000D = 0013+FA= 000D) the carry is dropped. Note that FA is 2’s complement of –6, meaning that the address of target is –6 bytes from the IP of the next instruction.

JNE/JNZ = Jump on Not Equal/Not Zero	01110101	disp
JNL/JGE = Jump on Not Less/Greater or Equal	01111101	disp

Problem-4

Write the Op-code for the ALP with Near Jump

0100	33 DB	XOR BX, BX
0102	B8 0001	start: MOV AX,1h
0105	03 C3	ADD AX,BX
0107	-----	JMP Next
0300	8B D8	Next: MOV BX,AX
0302	-----	JMP start

Problem-4

Write the Op-code for the ALP with Near Jump
Solution

0100	33 DB	XOR BX, BX
0102	B8 0001	start: MOV AX,1h
0105	03 C3	ADD AX,BX
0107	E9 F6 01	JMP Next (0300h-010Ah)=01F6h
0300	8B D8	Next: MOV BX,AX
0302	E9 FD FD	JMP start (0102h-0305h)=FDFD

JMP = Unconditional Jump:

Direct Within Segment	11101001	disp-low	disp-high
Direct Within Segment-short	11101011	disp	
Indirect Within Segment	11111111	mod 100 r/m	
Direct Intersegment	11101010	offset-low	offset-high
Indirect Intersegment	11111111	seg-low	seg-high
		mod 101 r/m	

Problem-5

Example: What is the content of the IP register after the JMP instruction
JMP 0800:0200h ? Write the Op-code for the JMP Instruction

Problem-5

Example: What is the content of the IP register after the JMP instruction
 JMP 0800:0200h ? Write the Op-code for the JMP Instruction

Code: EA 0002 0008

registers		0700:0107		0700:0107	
	H	L			
AX	00	01	07107: EA 234 R	JMP	00800h:00200h
BX	00	00	07108: 00 000 NULL	HLT	
CX	00	0E	07109: 02 002 0	RET	
DX	00	00	0710A: 00 000 NULL	NOP	
CS	0700		0710B: 08 008 BACK	NOP	
IP	0107		0710C: F4 244	NOP	
SS	0700		0710D: C3 195	NOP	
SP	FFFE		0710E: 90 144 E	NOP	
BP	0000		0710F: 90 144 E	NOP	
SI	0000		07110: 90 144 E	NOP	
DI	0000		07111: 90 144 E	NOP	
DS	0700		07112: 90 144 E	NOP	
ES	0700		07113: 90 144 E	NOP	
			07114: 90 144 E	NOP	
			07115: 90 144 E	NOP	
			07116: 90 144 E	NOP	
			07117: 90 144 E	NOP	
			07118: 90 144 E	NOP	
			07119: 90 144 E	NOP	
			0711A: 90 144 E	NOP	
			0711B: 90 144 E	NOP	
			0711C: 90 144 E	NOP	
			0711D: 90 144 E	NOP	
			0711E: 90 144 E	HLT	

registers		0800:0200	
	H	L	
AX	00	01	08200: 00 000 NULL
BX	00	00	08201: 00 000 NULL
CX	00	0E	08202: 00 000 NULL
DX	00	00	08203: 00 000 NULL
CS	0800		08204: 00 000 NULL
IP	0200		08205: 00 000 NULL
SS	0700		08206: 00 000 NULL
			08207: 00 000 NULL
			08208: 00 000 NULL
			08209: 00 000 NULL
			0820A: 00 000 NULL
			0820B: 00 000 NULL
			0820C: 00 000 NULL
			0820D: 00 000 NULL

Problem-6

Example: What is the content of the IP register after the JMP instruction?
JMP [BX]

CS = 0CDEH, BX = 1000H, DS = 1000H

IP = 0102H

Address	Contents
11002	F2
11001	02
11000	00

Problem-6

Example: What is the content of the IP register after the JMP instruction?
JMP [BX]

CS = 0CDEH, BX = 1000H, DS = 1000H

IP = 0102H

Address	Contents
11002	F2
11001	02
11000	00

After the execution of JMP:

New IP = 0200H

PA = CS × 10 + IP = 0CDE0 + 0200 = 0CFE0H

Problem-7

Write the code to find the first positive value in an array. Result should be in AL.

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Write the code to find the first positive value in an array. Result should be in AL.

Solution

Data

```
array DB 8,-3,-6,-1,-10,10,30,40,4 (First byte indicates  
array size)
```

Code

```
LEA SI, array  
Mov CL, [SI]  
Mov CH, 00h  
Next: INC SI  
Mov AL, [SI]  
TEST AL, 80H  
LOOPNZ Next
```



Thank You