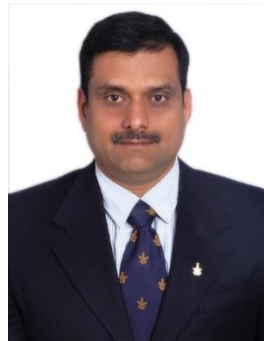




MPI Tutorial-8

8086 Branching Operations

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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 000D is 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
		seg-low	seg-high
Indirect Intersegment	11111111	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

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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

The image shows a debugger interface with two memory windows and register panels.

Left Memory Window (Address 0700:0107):

Address	Hex	Dec	Comment
07107	EA	234	Ω
07108	00	000	NULL
07109	02	002	0
0710A	00	000	NULL
0710B	08	008	BACK
0710C	F4	244	
0710D	C3	195	
0710E	90	144	É
0710F	90	144	É
07110	90	144	É
07111	90	144	É
07112	90	144	É
07113	90	144	É
07114	90	144	É
07115	90	144	É
07116	90	144	É
07117	90	144	É
07118	90	144	É
07119	90	144	É
0711A	90	144	É
0711B	90	144	É
0711C	90	144	É
0711D	90	144	É
0711E	90	144	É

Right Memory Window (Address 0800:0200):

Address	Hex	Dec	Comment
08200	00	000	NULL
08201	00	000	NULL
08202	00	000	NULL
08203	00	000	NULL
08204	00	000	NULL
08205	00	000	NULL
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

Registers (Left Window):

Register	H	L
AX	00	01
BX	00	00
CX	00	0E
DX	00	00
CS	0700	
IP	0107	
SS	0700	
SP	FFFE	
BP	0000	
SI	0000	
DI	0000	
DS	0700	
ES	0700	

Registers (Right Window):

Register	H	L
AX	00	01
BX	00	00
CX	00	0E
DX	00	00
CS	0800	
IP	0200	
SS	0700	

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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Problem-7

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