CPIT210 : Computer Organization and Architecture

CHAPTER 11: Instruction Sets: Addressing Modes and Formats

Tutorial

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Problems:

11.1 Given the following memory values and a one-address machine with an accumulator:

Word 20 contains 40
Word 30 contains 50
Word 40 contains 60
Word 50 contains 70

What values do the following instructions load into the accumulator?

a. Load IMMEDIATE 20
b. Load DIRECT 20
c. Load INDIRECT 20
d. Load IMMEDIATE 30
e. Load DIRECT 30
f. Load INDIRECT 30

Solution:

a. 20
b. 40
c. 60
d. 30
e. 50
f. 70

11.2 Let the address stored in the program counter be designated by the symbol X1. The instruction stored in X1 has an address part (operand reference) X2. The operand needed to execute the instruction is stored in the memory word with address X3. An index register contains the value X4. What is the relationship between these various quantities if the addressing mode of the instruction is

a) Direct. b) indirect. c) PC relative. d) indexed

Solution:

a) X3=X2
b) X3=(X2)
c) X3=X1+X2+1
d) X3=X2+X4

11.3 An address field in an instruction contains decimal value 14. Where is the corresponding operand located for:

a) immediate addressing?

b) direct addressing?

c) indirect addressing?

d) register addressing?

e) register indirect addressing?

Solution:

Instruction

Opcode	Address 14

a) 14 (The address field).

b) Memory location 14.

c) The memory location whose address is in memory location 14.

d) Register 14.

e) The memory location whose address is in register 14.

11.4 Consider a 16-bit processor in which the following appears in main memory, starting at location 200:

200	Load to AC	Mode
201	500	
202	Next instruction	

The first part of the first word indicates that this instruction loads a value into an accumulator. The Mode field specifies an addressing mode and, if appropriate, indicates a source register; assuming that when used, the source register is R1, which has a value of 400. There is also a base register that contains the value of 100. the value of 500 in location 201 may be part of the address calculation. Assume that location 399 contains the value 999, location 400 contains the value 1000, and so on. Determine the effective address and the operand to be loaded for the following addressing modes:

a. Direct.

b. Immediate.

c. Indirect.

d. PC relative.

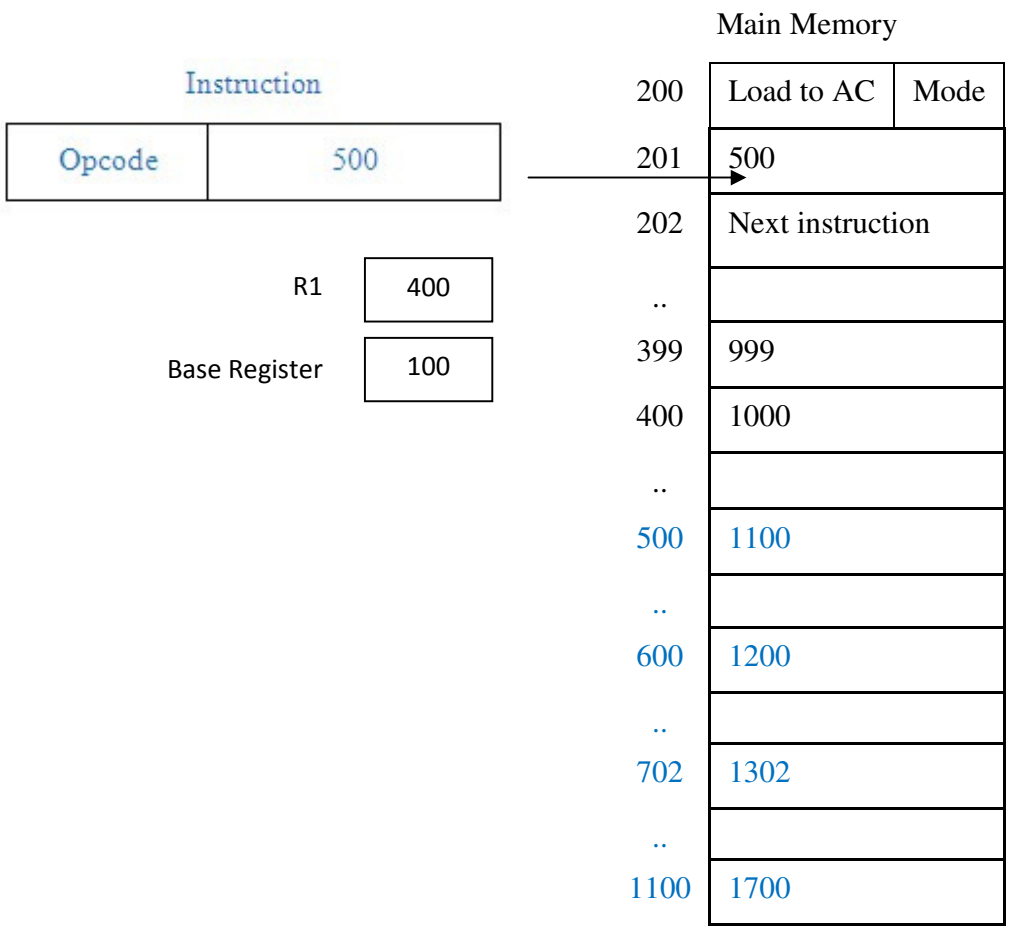
e. Displacement.

f. Register.

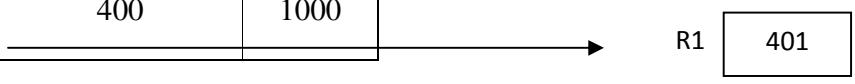
g. Register indirect.

h. Autoindexing with increment, using R1

Solution:



	EA	Operand
a	500	1100
b	201	500
c	1100	1700
d	201+1+500 =702	1302
e	500+100=600	1200
f	R1	400
g	400	1000
h	400	1000



R1 is incremented after the execution of the instruction.