

Example problem

	Address	Memory	
PC	200	Load to AC	Mode
R1	400	Address = 500	
XR	100	Next Instruction	
AC			
	399	450	
	400	700	
	500	800	
	600	900	
	702	325	
	800	300	

PC = Program Counter

R1 = Register

XR = Index Register

AC = Accumulator

- Memory is having first instruction to load AC
- Mode will specify the addressing mode to get operand.
- Address field of instruction is 500.

Find out the effective address of operand and operand value by considering different addressing modes.

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	201	Address = 500
XR	202	Next Instruction
AC	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

1. Immediate Addressing Mode

- As instruction contains immediate number 500.
- It is stored as address 201.

Effective Address = 201
Operand = 500

AC **500**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	400	Address = 500
XR	100	Next Instruction
AC		
	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

2. Register Addressing Mode

- Register R1 contains 400.
- As operand is in register so no any memory location.

Effective Address = Nil
Operand = 400

AC **400**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	400	Address = 500
XR	100	Next Instruction
AC		
	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

3. Register Indirect Addressing Mode

- Register R1 contains 400.
- So effective address of operand is 400.
- The data stored at 400 is 700.

Effective Address = 400

Operand = 700

AC **700**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	201	Address = 500
XR	202	Next Instruction
AC	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

4. Direct Addressing Mode

- Instruction contains the address 500.
- So effective address of operand is 500.
- The data stored at 500 is 800.

Effective Address = 500
Operand = 800

AC **800**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	400	Address = 500
XR	100	Next Instruction
AC		
	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

5. Indirect Addressing Mode

- Instruction contains the address 500.
- Address at 500 is 800.
- So effective address of operand is 800.
- The data stored at 800 is 300.

Effective Address = 800
Operand = 300

AC **300**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	400	Address = 500
XR	100	Next Instruction
AC		
	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

6. Relative Addressing Mode

- PC = 200.
- Offset = 500.
- Instruction is of 2 bytes.
- So effective address = $PC + 2 + \text{offset} = 200 + 500 + 2 = 702$.
- The data stored at 702 is 325.

Effective Address = 702
Operand = 325

AC 325

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	201	Address = 500
XR	202	Next Instruction
AC	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

7. Index Addressing Mode

- $XR = 100$.
- $Base = 500$.
- So effective address = $Base + XR = 500 + 100 = 600$.
- The data stored at 600 is 900.

Effective Address = 600
Operand = 900

AC **900**

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	201	Address = 500
	202	Next Instruction
XR		
	399	450
AC	400	700
	500	800
	600	900
	702	325
	800	300

8. Autoincrement Addressing Mode

- It is same as register indirect addressing mode except the contents of R1 are incremented after the execution.
- R1 contains 400.
- So effective address of operand is 400.
- The data stored at 400 is 700.

Effective Address = 400

Operand = 700

R1 401

AC 700

Example problem

	Address	Memory
PC	200	Load to AC Mode
R1	201	Address = 500
	202	Next Instruction
XR		
AC	399	450
	400	700
	500	800
	600	900
	702	325
	800	300

9. Autodecrement Addressing Mode

- It is same as register indirect addressing mode except the contents of R1 are decremented before the execution.
- R1 contains 400.
- R1 is first decremented to 399.
- So effective address of operand is 399.
- The data stored at 399 is 450.

Effective Address = 399

Operand = 450

R1 399

AC 450

Example problem

Addressing Mode	Effective Address	Operand
Immediate Addressing Mode	201	500
Register Addressing Mode	Nil	400
Register Indirect Addressing Mode	400	700
Direct Addressing Mode	500	800
Indirect Addressing Mode	800	300
Relative Addressing Mode	702	325
Indexed Addressing Mode	600	900
Autoincrement Addressing Mode	400	700
Autodecrement Addressing Mode	399	450