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SNS College of Technology, Coimbatore-35.
(Autonomous)
B.E/B.Tech- Internal Assessment -I
Academic Year 2022-2023(ODD)
Third Semester
Computer Science and Engineering

19ITT202 Computer Organization and Architecture
[Common to CSE & IT]

Time: 1.5 Hours **Maximum Marks: 50**

Answer All Questions

PART - A (5x 2 = 10 Marks) **CO** **Blooms**

1. List out the components of functional units of Computer. CO1 Rem

A computer in its simplest form comprises of five functional units namely

- **input unit,**
- **output unit,**
- **memory unit,**
- **arithmetic & logic unit &**
- **control unit**.

2. Consider the C← [A] + [B] operation to be performed, write the sequence of instructions to be executed to perform the operation without destroying the former contents of location A and B, with respect to one, two & three address instruction. CO1 App

3 addr	Add A,B,C
2 addr	Move B,C Add A,C
1 addr	Load A Add B Store C

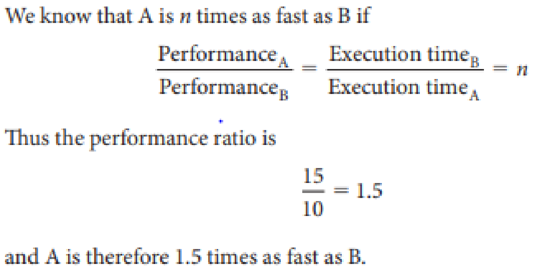
3. Define Bus and label different types of buses used. CO1 Und

A group of lines, that serves as a connecting path for several devices is called as a bus.

Three types of bus are used

- Address bus
- Data bus
- Control bus

4. If computer A runs a program in 10 seconds and computer B runs the same program in 15 seconds. How much faster is A than B. CO1 App



We know that A is n times as fast as B if

$$\frac{\text{Performance}_A}{\text{Performance}_B} = \frac{\text{Execution time}_B}{\text{Execution time}_A} = n$$

Thus the performance ratio is

$$\frac{15}{10} = 1.5$$

and A is therefore 1.5 times as fast as B.

5. Find 1's and 2's Complement of 1100 CO2 Und

To get 1's complement of a binary number, simply invert the given number. To get 2's complement of a binary number, simply invert the given number and add 1 to the least significant bit (LSB) of given result.

1's complement – 0011
2's complement - 0100

PART – B (13+13+14=40 Marks)

6. (a) Summarize the functional units of computer by extending the basic operational concepts. 13 CO1 Und

A computer in its simplest form comprises of five functional units namely

- **input unit,**
- **output unit,**
- **memory unit,**
- **arithmetic & logic unit &**
- **control unit**.

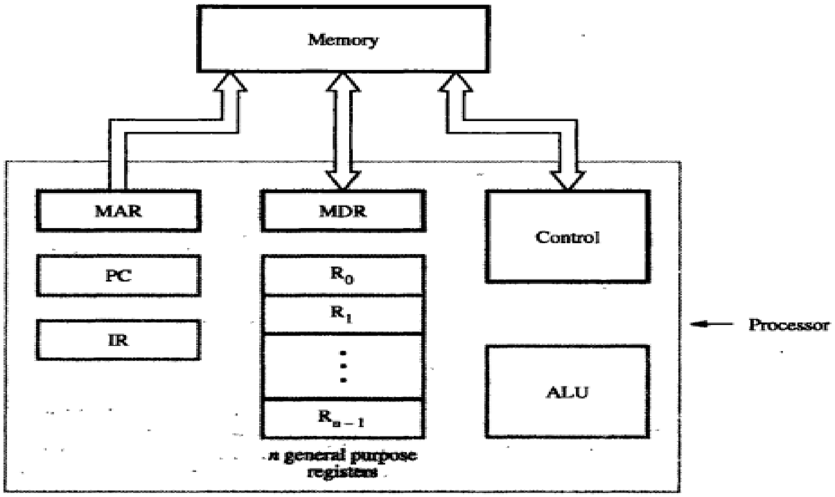


Figure 1.2 Connections between the processor and the memory.

(or)

(b) Illustrate the execution of straight-line sequencing & branching instruction. Construct & compare the sequence of instruction to be performed for adding n numbers in both sequencing & branching instruction. 13 CO1 App

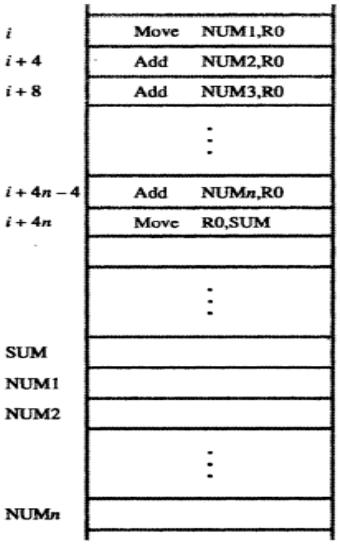


Figure 2.9 A straight-line program for adding *n* numbers.

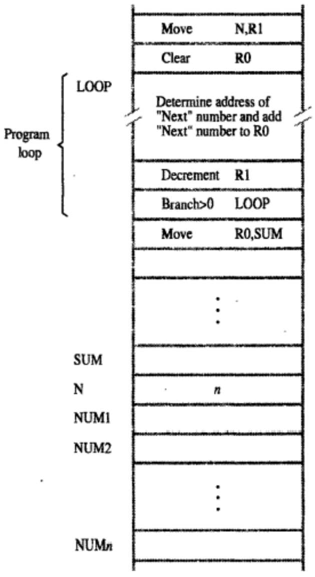
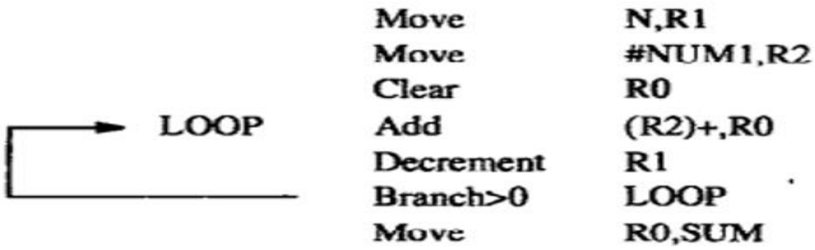


Figure 2.10 Using a loop to add *n* numbers.

7. (a) Interpret different addressing modes and experiment all modes by assuming the addition operation of N numbers to be performed and saved in SUM. 13 CO1 App



```
        Move        N,R1
        Move        #NUM1,R2
        Clear       R0
LOOP    Add         (R2)+,R0
        Decrement   R1
        Branch>0    LOOP
        Move        R0,SUM
```

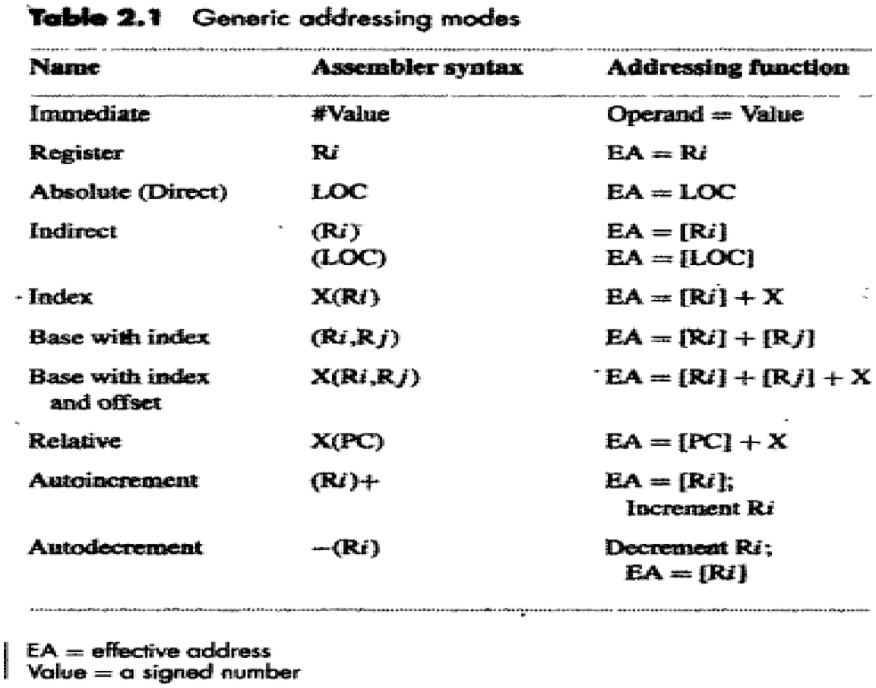


Table 2.1 Generic addressing modes

Name	Assembler syntax	Addressing function
Immediate	#Value	Operand = Value
Register	R*i*	EA = R*i*
Absolute (Direct)	LOC	EA = LOC

Indirect	(R*i*)
	(LOC)
		EA = [R*i*]
		EA = [LOC]

Index	X(R*i*)	EA = [R*i*] + X
Base with index	(R*i*,R*j*)	EA = [R*i*] + [R*j*]
Base with index and offset	X(R*i*,R*j*)	EA = [R*i*] + [R*j*] + X
Relative	X(PC)	EA = [PC] + X
Autoincrement	(R*i*)+	EA = [R*i*]; Increment R*i*
Autodecrement	−(R*i*)	Decrement R*i*; EA = [R*i*]

EA = effective address
Value = a signed number

(or)

(b) Identify the concept of addition and subtraction of signed numbers and examine the usage of each level in a problem. 13 CO2 Ana

Addition (subtraction) Algorithm

- When the sign of A and B are identical (different) , add the magnitudes and attach the sign of A to the result.
- When the signs of A and B are different (identical), compare the magnitudes and subtract the smaller number from the larger.
  - ➢ Choose the sign of result to be same as A if A>B
  - ➢ or the complement of sign of A if A<B
  - ➢ if A=B subtract B from A and make the sign of result positive

Operation	Add Magnitudes	Subtract Magnitudes		
		A>B	A<B	A=B
(+A)+(+B)	+(A+B)			
(+A)+(-B)		+(A-B)	-(B-A)	+(A-B)
(-A)+(+B)		-(A-B)	+(B-A)	+(A-B)
(-A)+(-B)	-(A+B)			
(+A)-(+B)		+(A-B)	-(B-A)	+(A-B)
(+A)-(-B)	+(A+B)			
(-A)-(+B)	-(A+B)			
(-A)-(-B)		-(A-B)	+(B-A)	+(A-B)

8. (a) Registers R1 and R2 of a computer contain the decimal values 1200 and 4600. In each of the following instructions determine the Addressing mode used in the instruction and find the effective address of the memory operand? 14 CO1 App

a) Load 20(R1),R5
b) Move #3000,R5
c) Store R5,30(R1,R2)
d) Add –(R2),R5
e) Subtract (R1)+,R5

Registers R1 and R2 of a computer contain the decimal values 1200 and 4600, we have to find effective adress of associated memory operand in each instruction:

Load 20(R1),R5 : This means load 20+R1 into R5 . R1= 1200 , R1 + 20 = 1220 , so R5 have 1220 , Effective address of R5 is 1220.

Move #3000,R5 : This means move value 3000 into R5 , so effective address is part of the instruction whose value is 3000.

Now R5 = 3000

Store R5,30(R1,R2) : This means 30+R1+R2 and store the result into R5 .

so R5 = 30+1200+4600 = 5830 , so now R5 value is 5830 , the effective address is 5830.

Add -(R2),R5 : This means -1 from R2 value and store the result into R5 . So R5= 4600 - 1 = 4599 , effective address of R5 is 4599 . It is pre decrement addressing.

Subtract (R1)+,R5 : This means effective address is contents of R1 so EA = 1200 .

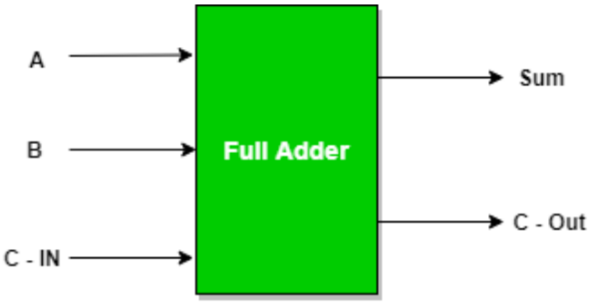
It is post increment addressing .

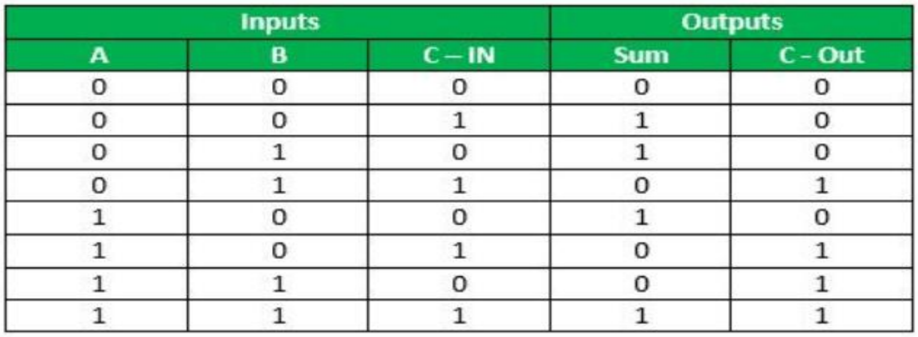
Effective addresses are

1. 1220
2. 3000 [it is not the effective address , it is the address of the instruction part where 3000 is stored]
3. 5830
4. 4599
5. 1200

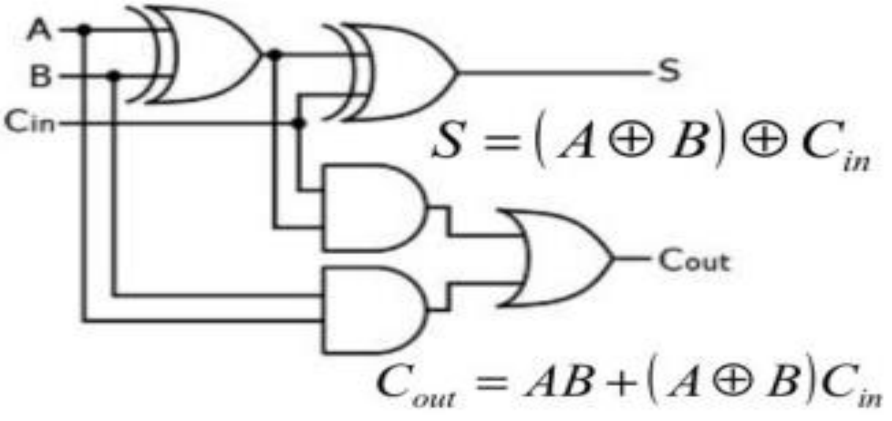
(or)

(b) Design and inspect the operation of Full Adder. 14 CO2 Und





Inputs			Outputs	
A	B	C – IN	Sum	C - Out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1



$$S = (A \oplus B) \oplus C_{in}$$

$$C_{out} = AB + (A \oplus B) C_{in}$$

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(Note: Und-Understand Rem-Remember Ana-Analyze App-Apply Cre- Create)

Prepared By Verified By HoD