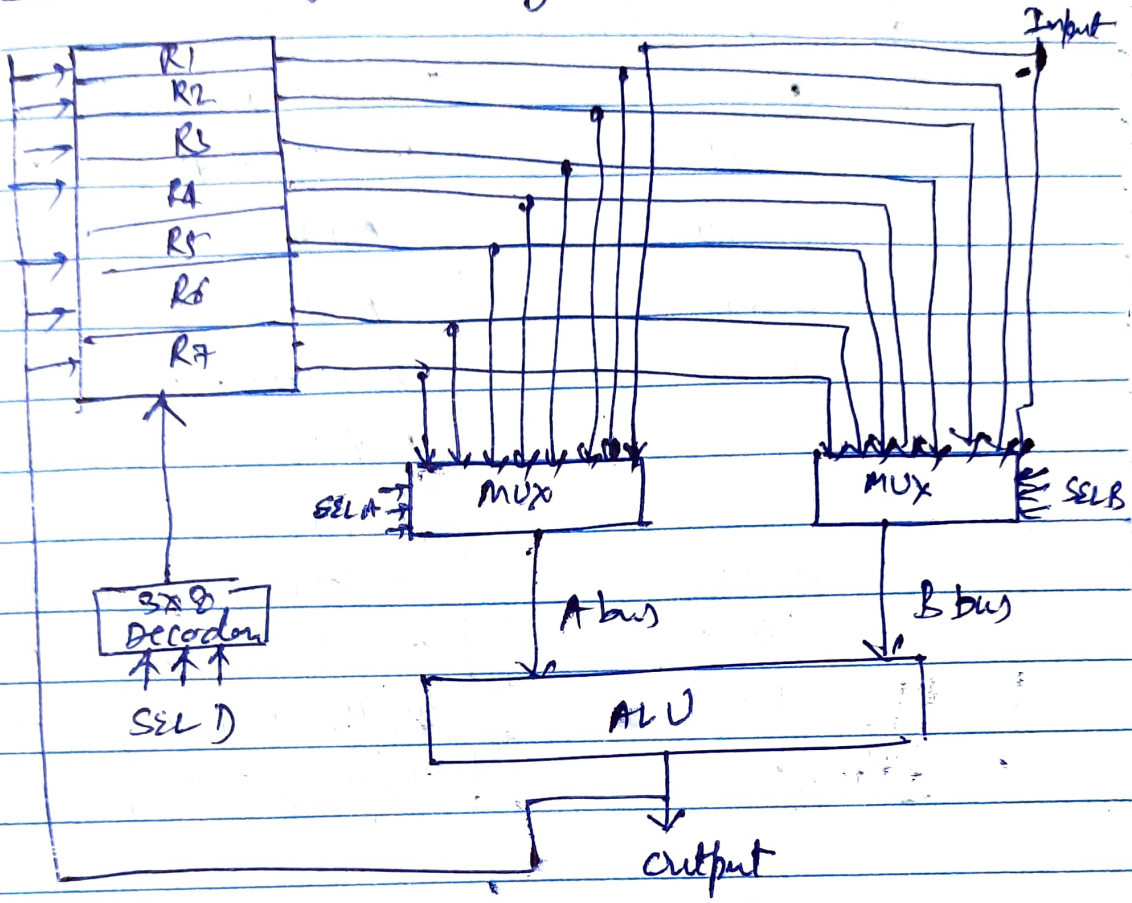
Lecture-5

Date.
Page No.

General Register organization



Example.

SEL A: 001

SEL B: 010

SEL OPR: 10010

SEL REG or SEL D: 011

Register & MUX Input Selector Code

Binary Code	SEL A	SEL B	SEL D or SEL-REG
000	Input	Input	—
001	R1	R1	R1
010	R2	R2	R2
011	R3	R3	R3
100	R4	R4	R4
101	R5	R5	R5
110	R6	R6	R6
111	R7	R7	R7

Date.
Page No.

Operation with Symbol:

Operation selection Code	Operation	Symbol
0000	Transfer A	TSFA
0001	Increment A	INC A
0010	A+B	ADD
0011	A−B	SUB
0100	Decrement A	DEC
0101	A AND B	AND
0110	A OR B	OR
0111	A XOR B	XOR
1000	Complement A	COM A
1001	Shift right A	SHR
1010	Shift left A	SHL

Control word.

SEL A	SEL B	SEL REG OR SEL D	SEL OPR

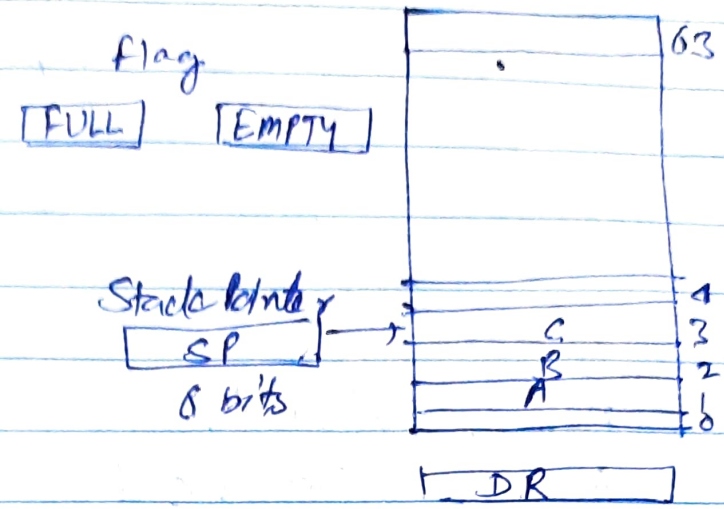
Eg. $R2 \leftarrow R1 + R3$

SEL A	SEL B	SEL D	SEL OPR
001	011	010	0010

Lecture-6

Date.
Page No.

STACK ORGANIZATION



PUSH, POP operations

/* Initially, SP=0, EMPTY=1, FULL=0 */

PUSH

SP ← SP+1

M[SP] ← DR

If (SP=0) then FULL

EMPTY ← 0

POP

DR ← M[SP]

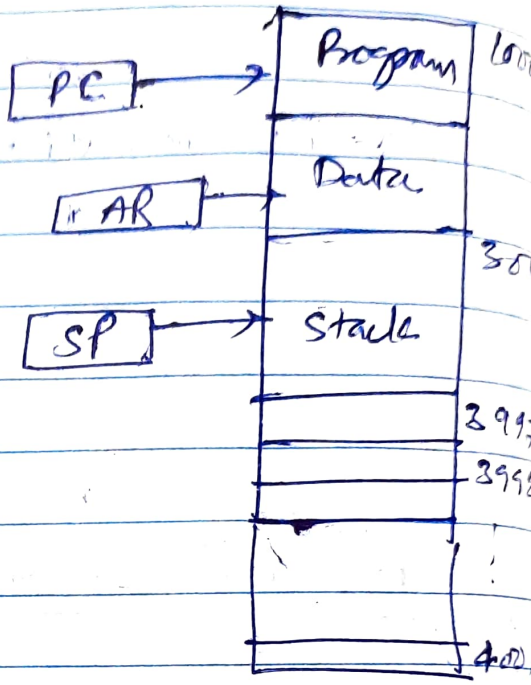
SP ← SP-1

If (SP=0) then (EMPTY ← 1)

FULL ← 0

Date.
Page No.

Memory Stack Organization



Memory stack with program, Data and Stack Segment

- A portion of Memory is used as a stack with a processor register as a stack pointer

- PUSH: SP ← SP−1
  M[SP] ← DR

- POP: DR ← M[SP]
  SP ← SP+1

Arithmetic Expression Evaluation

1. Polish Notation (Prefix Notation)
2. Reverse Polish Notation (Postfix Notation)

⇒

e.g. Infix notation: (A−B)*[C/(D+E)+F]
Post fix notation: AB−CDE+/F+*

Date
Page No.

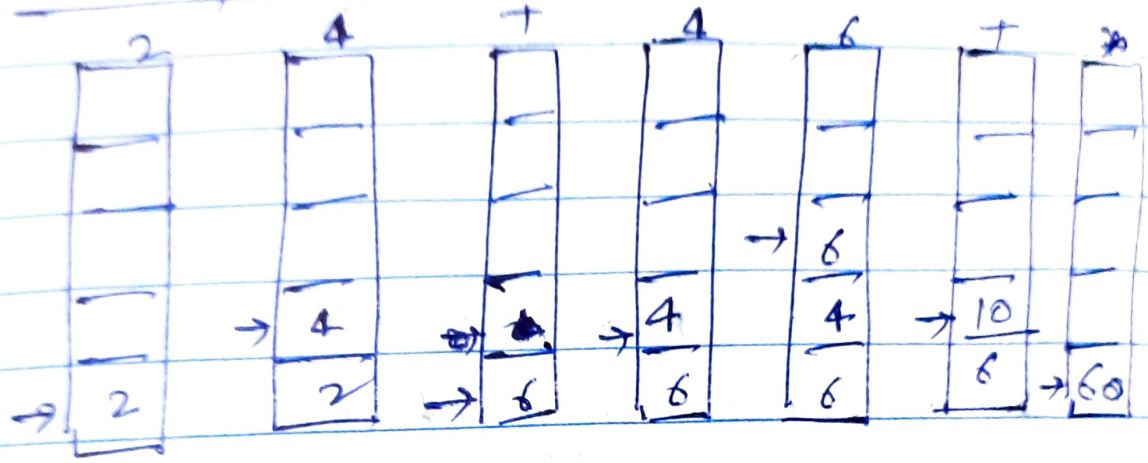
Example

Infix notation: (2+4)*(4+6)

Post fix: 2 4 + 4 6 + *

Result = 60

stack operations



Lecture 7 Date. Page No.

Instruction format

1. Single Accumulator Organization
2. General Register Organization
3. Stack Organization

e.g.

$X = (A+B) * (C+D)$

⇒ Solve with General register organization

Three Address Instructions

```
ADD  R1, A, B
ADD  R2, C, D
MUL  X, R1, R2
```

Two Register organization

```
MOV  R1, A
ADD  R1, B
MOV  R2, C
ADD  R2, D
MUL  R1, R2
MOV  X, R1
```

⇒ Solve with Single Accumulator Organization

One Address Organization

```
LOAD  A
```

```
ADD  B
STORE T
LOAD  C
ADD  D
MUL  T
STORE X
```

⇒ Stack Organization

Zero Address Organization

First convert it to postfix

postfix A, B +, C, D + *

Now

```
PUSH A
PUSH B
ADD
PUSH C
PUSH D
ADD
MUL
POP X
```

Lecture-8

Date.
Page No.

ADDRESSING MODE

Types of Addressing Mode

1. Implied / Implicit
2. Immediate
3. Direct
4. Indirect
5. Register Direct
6. Register Indirect
7. Relative
8. Indexed
9. Base Register
10. Auto-Increment
11. Auto-Decrement.

How can be find the Effective Addres with the use of Addressing mode Let us discuss with an example.

In this example we are take four Registers 1. Program counter (PC), Register (R1), Indexed Register (XR) and Accumulator (AC)

We have to load data in AC.

Date. _____
Page No. _____

PC = 200

R1 = 400

XR = 100

AC

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

Addressing Mode	Effective Address	Content of AC
Direct Address	500	800
Immediate operand	201	500
Indirect address	800	300
Relative address	702	325
Indexed address	600	900
Register	—	400
Register Indirect	400	700
Auto increment	400	700
Auto decrement	399	450