Project Planning & Control

Lesson 5
Networks - Introduction, Techniques

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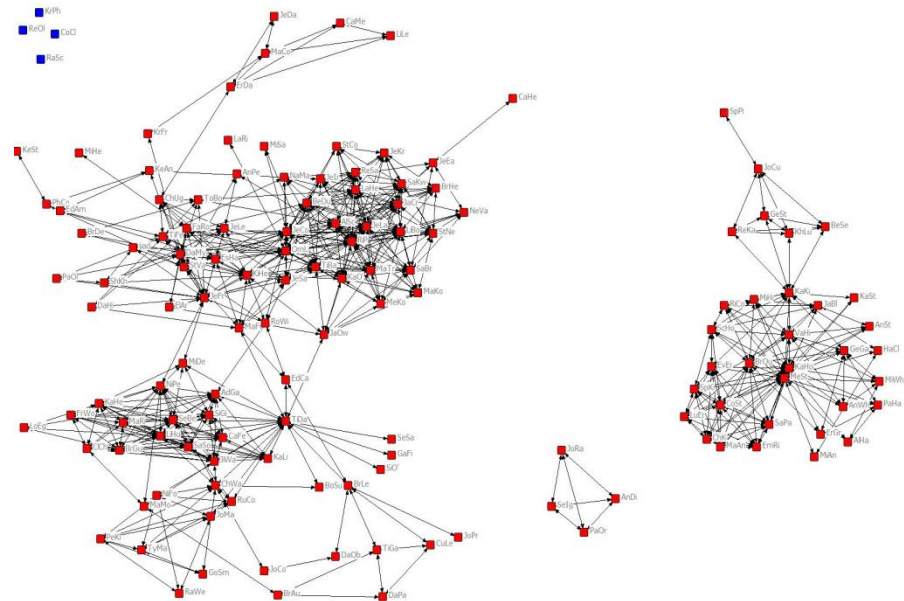*Department of Civil Engineering*

I.I.T. Madras

Networks Techniques

- Basic representation

Node — Link/Arr — Node
I — ow — J

Node — Link/Arr — Node
I — ow — J

- Used in many domains
  - Roads
  - Pipelines
  - Truss /Frame
  - Telephone / Internet
  - Social Network

Networks for Time Management

- Developed by Du Pont, Remington Rand & UNIVAC in 1958

- CPM Based Scheduling Method

- Represents Complex Relationship between Activities

- Reliable Techniques to Determine Most Planning Results

- Requires Training to Interpret

Node   Node

I ————— Link/Arrow ————→ J

Representations

- Activity on Arrow (AoA)   Original method

- Activity on Node (AoN)   Modified by Fondhal in 60's

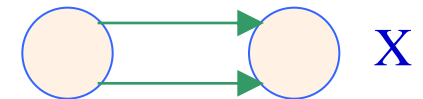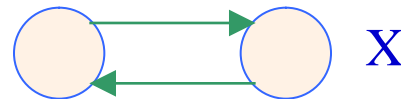- Precedence Diagramming Method (PDM) IBM's Extension of AoN

Networks - AoA

Event   Event

(I) ———— Activity ————→ (J)

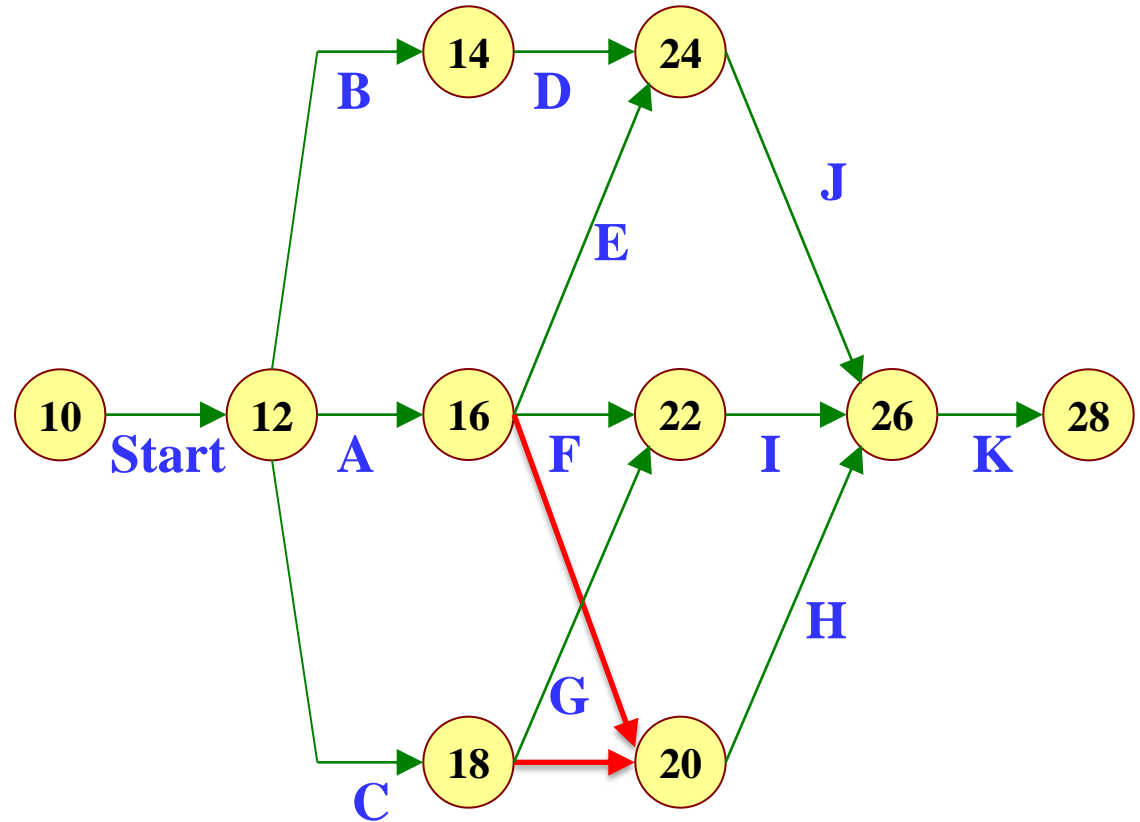*I* Event - *Activity* Start   *J* Event - *Activity* End

Conditions

- Events Must Have Unique Numbers

- Activities Must Have Unique IJ Combinations   X

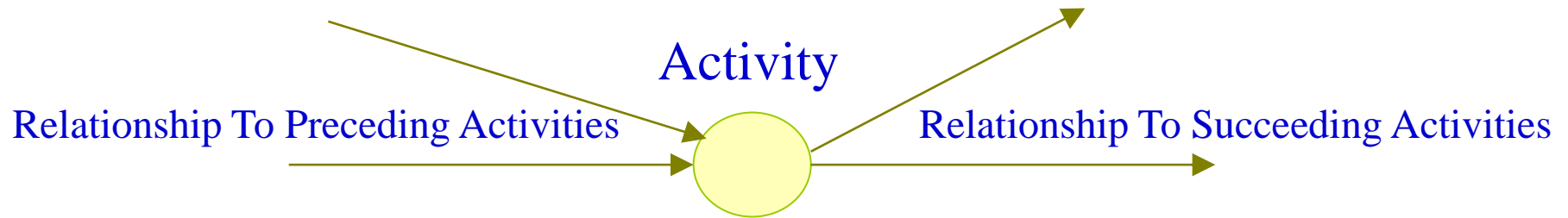- No Closed Loops   X

- No Dangling Activities

Networks - AoA

Activity	Preceding Activity
Start	-
A	Start
B	Start
C	Start
D	B
E	A
F	A
G	C
H	A,C
I	F,G
J	D,E
K	J,I,H

Dummy Activities to capture precedence logic

Networks - AoN

Activity

Relationship To Preceding Activities

Relationship To Succeeding Activities
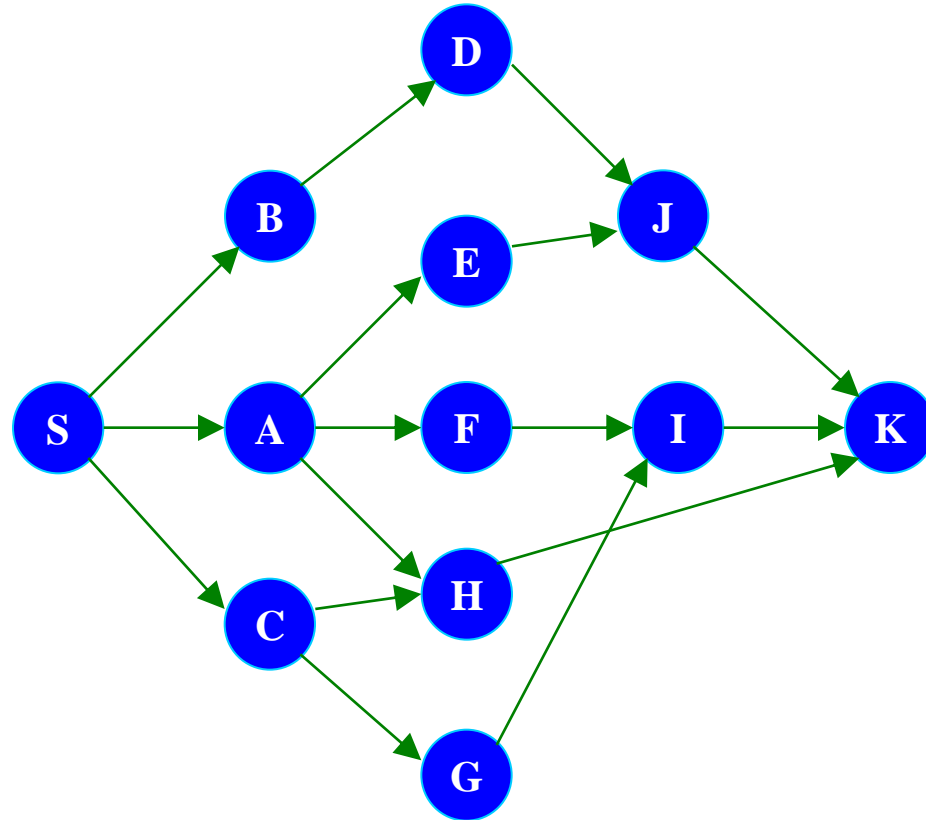
- Logic is More Naturally Represented than in AoA

- No Dummy activities required to represent logic

- Easier to Interpret than AoA
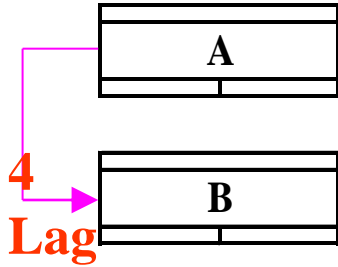
- Most software tools use AON /PDM

Networks - AoN

Activity	Preceding Activity
Start	-
A	Start
B	Start
C	Start
D	B
E	A
F	A
G	C
H	A,C
I	F,G
J	D,E
K	J,I,H

Networks - PDM

Activity Relationships
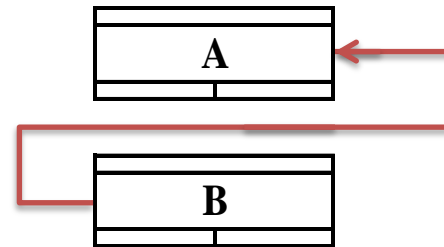
SS – Start to Start

A

4
Lag

B
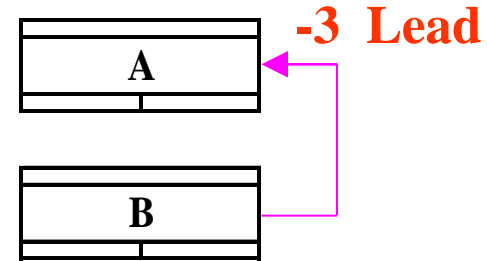
FF – Finish to Finish
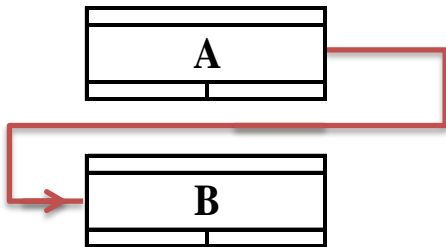
-3 Lead

A

B

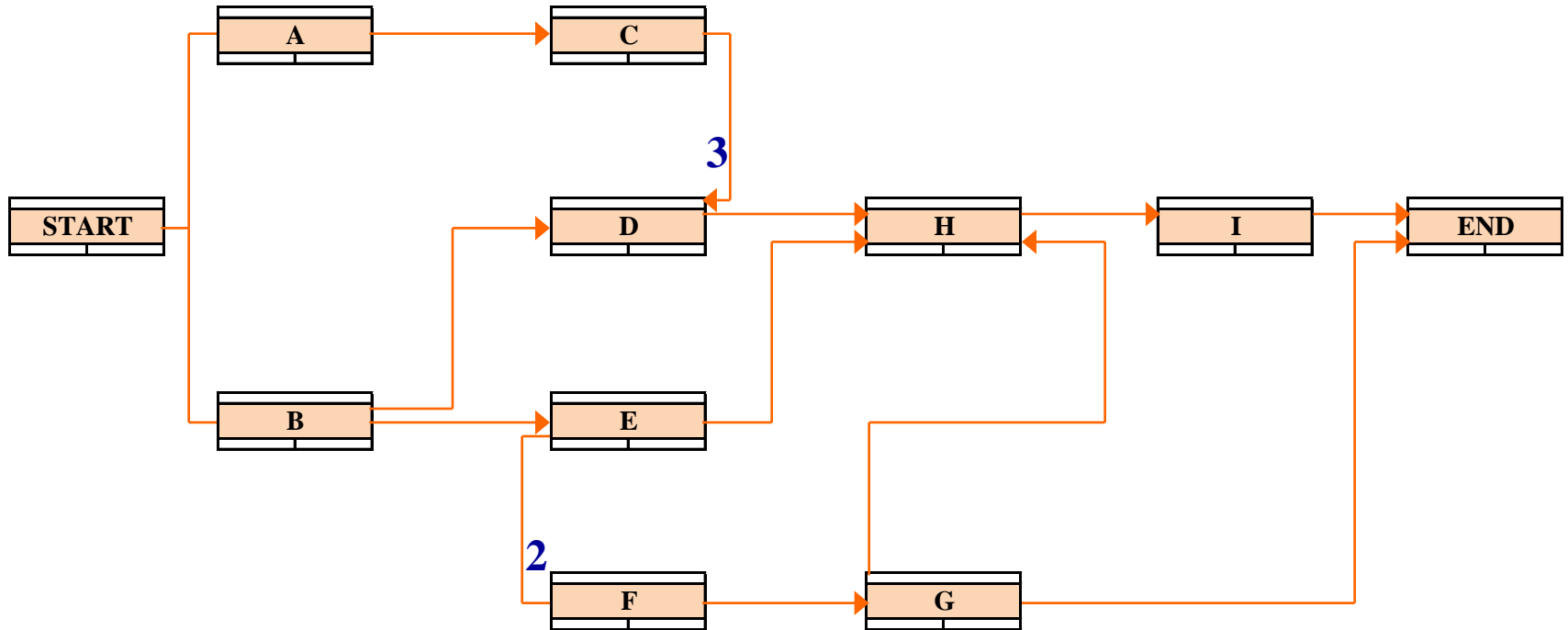**FS – Finish to Start**

A

B

SF – Start to Finish

A

B

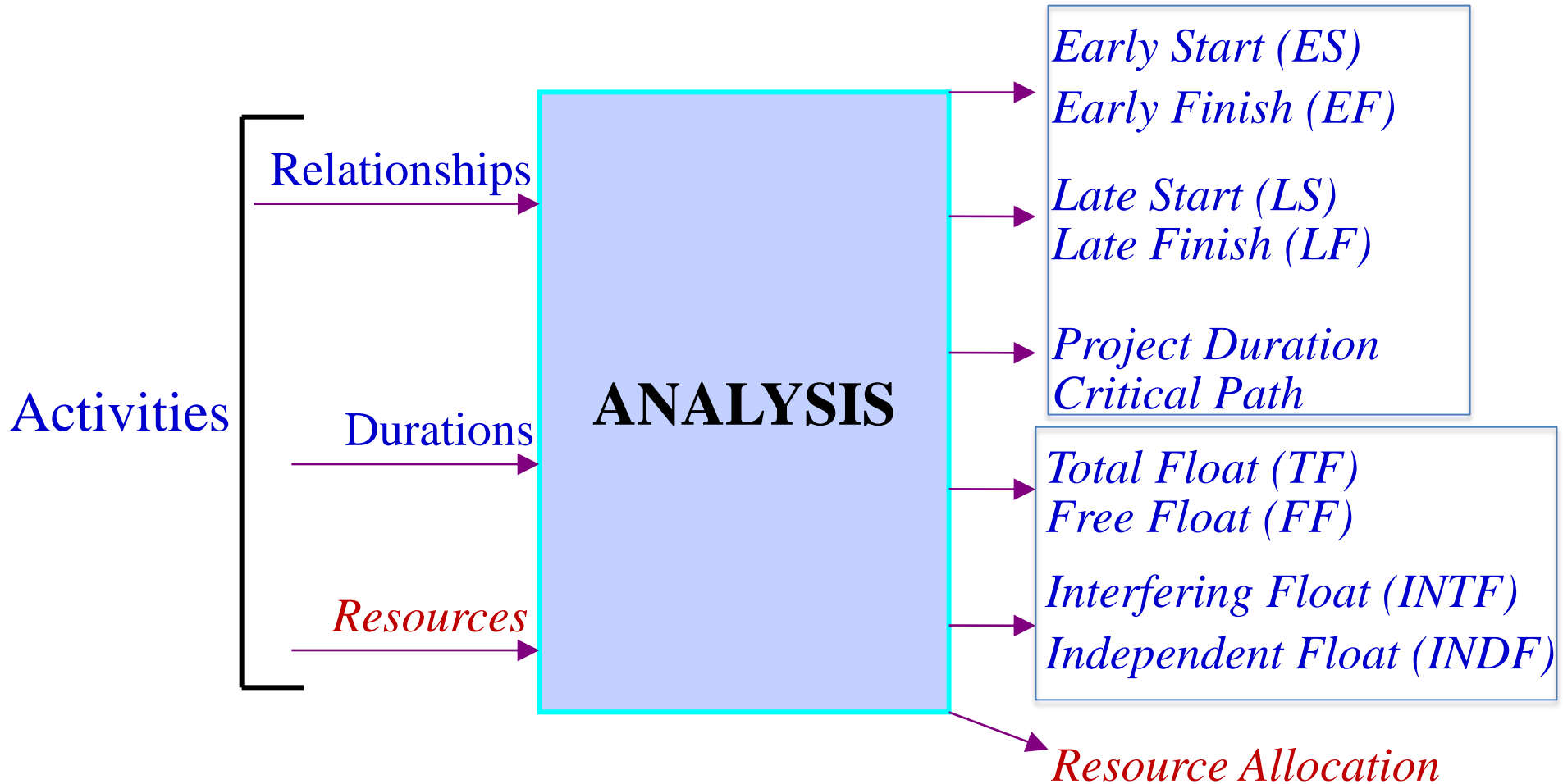*Will be discussed in detail during PDM lecture*

Networks - PDM

Representation

Will be discussed in detail during PDM lecture

Networks Analysis

Definitions – Basic Outputs

| TERM	DEFINITION
Early Start	The earliest day on which an activity can start
Early Finish	The earliest day on which an activity can finish
Late Start	The latest day an activity can start without delaying the project duration
Late Finish	The latest day an activity can finish without delaying the project
Project Duration	Minimum time required to complete the project
Critical path	Activities on the Longest Path in the network

NETWORK ANALYSIS
EXAMPLE-1 ABCD Project

Activity	Duration	Predecessor
A	5	-
B	4	A
C	6	A
D	3	B,C

1. Represent as a AON Network

2. Find Early Start, Early Finish (Forward Pass)

3. Find Late Finish, Late Start (Backward Pass)

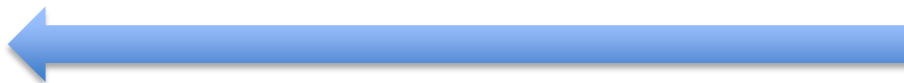4. What is the Project duration ? Identify Critical Activities

EXAMPLE-1 – ABCD Project

Activity	Duration	Predecessor
A	5	-
B	4	A
C	6	A
D	3	B,C

FORWARD PASS
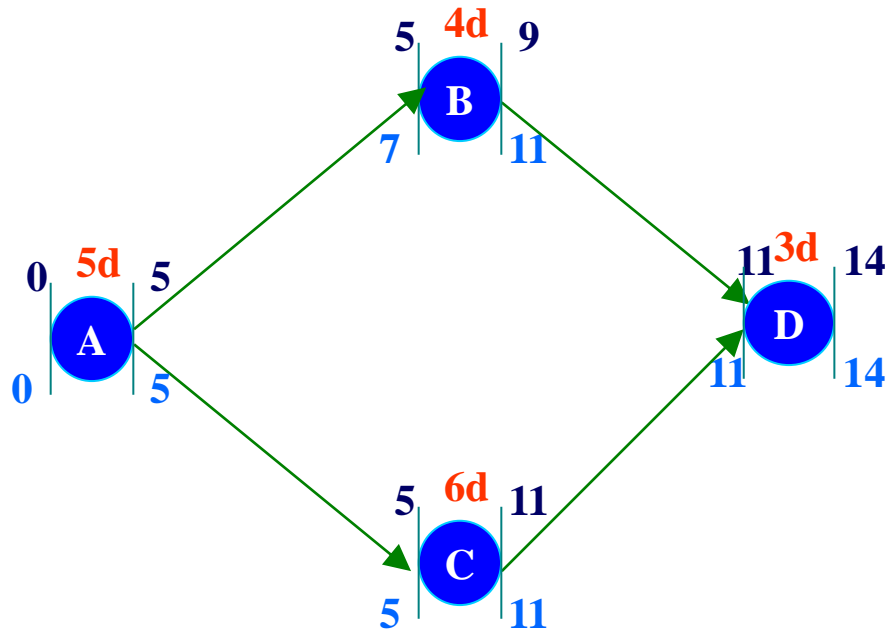
BACKWARD PASS

ACT	Early Start	Early Finish	Late Start	Late Finish	Critical
A	0	5	0	5	Y
B	5	9	7	11	N
C	5	11	5	11	Y
D	11	14	11	14	Y