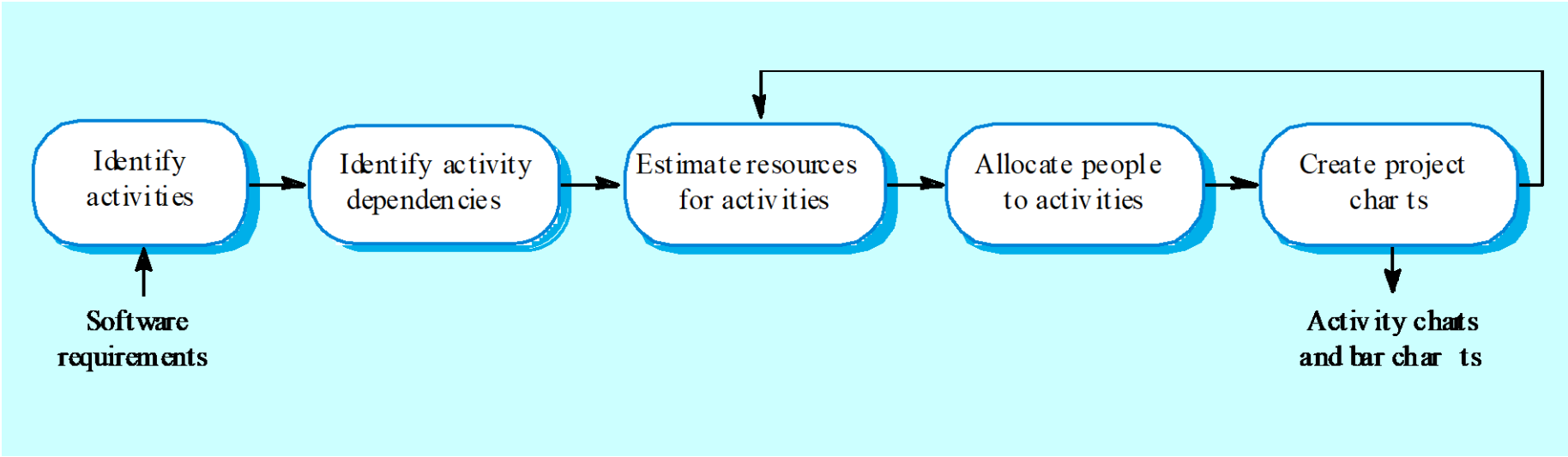
SOFTWARE ENGINEERING

Spring 2024

PROJECT SCHEDULING

- Split project into tasks and estimate time and resources required to complete each task.
- Organize tasks concurrently to make optimal use of workforce.
- Minimize task dependencies to avoid delays caused by one task waiting for another to complete.
- Dependent on project managers intuition and experience.

THE PROJECT SCHEDULING PROCESS



SCHEDULING PROBLEMS

- Estimating the difficulty of problems and hence the cost of developing a solution is hard.
- Productivity is not proportional to the number of people working on a task.
- Adding people to a late project makes it later because of communication overheads.
- The unexpected always happens. Always allow contingency in planning.

BAR CHARTS AND ACTIVITY NETWORKS

- Graphical notations used to illustrate the project schedule.
- Show project breakdown into tasks. Tasks should not be too small. They should take about a week or two.
- Activity charts show task dependencies and the critical path.
- Bar charts show schedule against calendar time.

NETWORK PLANNING MODELS

- Both Pert and CPM use Activity-on-Arrow approach
  - Visualize the project as a network
  - Activities are drawn as arrows joining circles, or nodes, which represent the possible start and/or completion of an activity or set of activities.

Commute to Office, 1 hour

8:30AM
Early Start

9:30AM
Early Finish

Commute to Office, 1 hour

Early Finish=Early start+Duration

8:30AM
Early Start

9:30AM
Early Finish

Commute to Office, 1 hour

9:30AM
Late Start

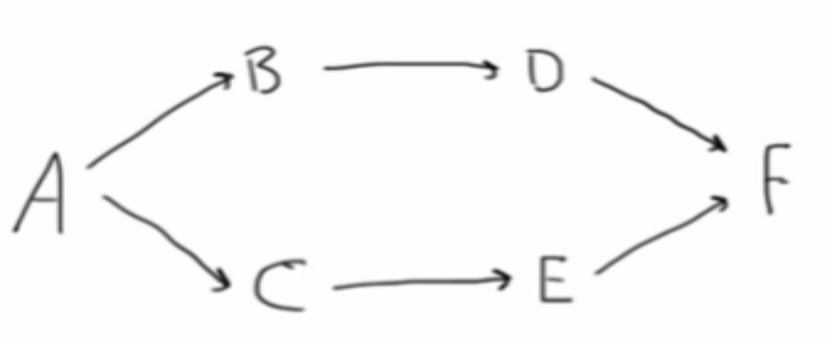
10:30AM
Late Finish

Early Finish=Early start+Duration

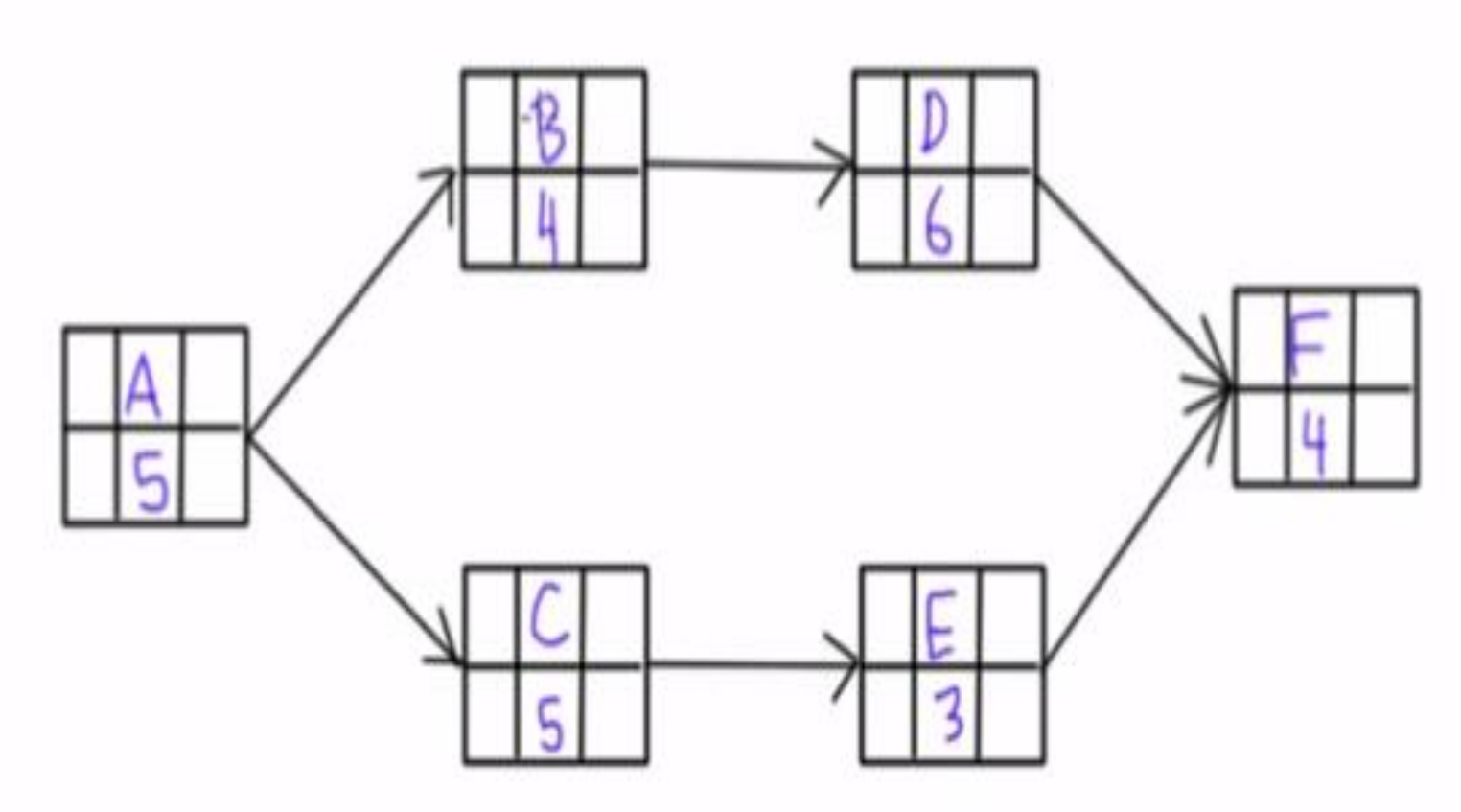
Late Start=Late Finish-Duration

Example: Activity Network

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



Example: Activity Network



Some Definitions

Early Start represents the earliest date an activity can possibly begin, based on all its predecessors and successors.

Early Finish represents the earliest date an activity can possibly finish, if all predecessors and successors also finish on their respective early finish dates.

Late start represents the latest an activity can start without affecting the planned project finish date.

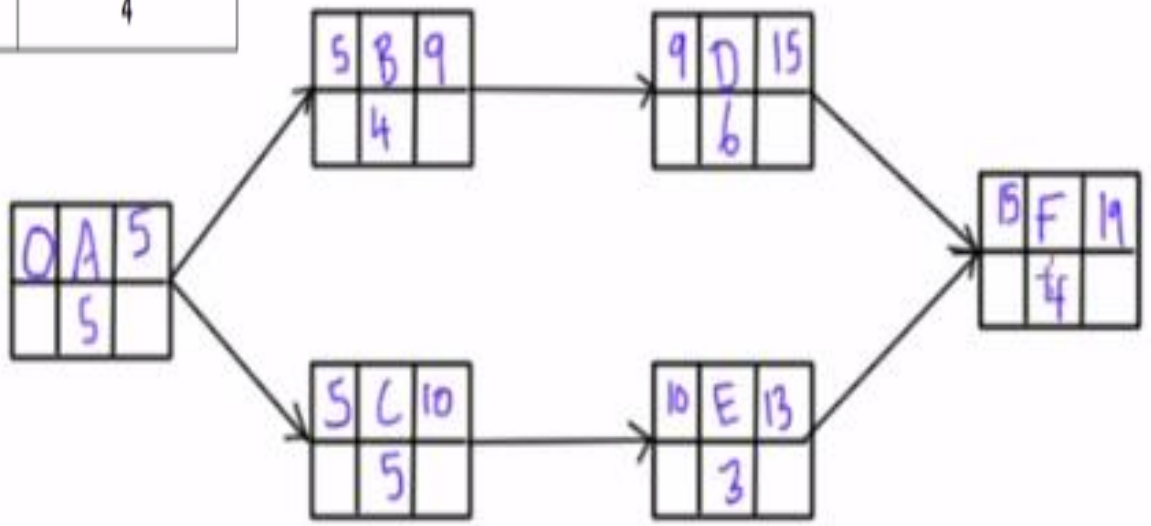
Late Finish represents the latest date an activity can finish, without delaying the finish of the project.

Total float, also called **float** or **slack**, is the amount of time an activity can be delayed without delaying the **overall project** duration.

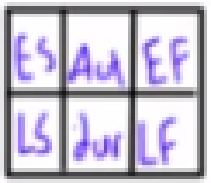
Free float is the amount of time an activity can be delayed without delaying the early start of any immediate successor activity.

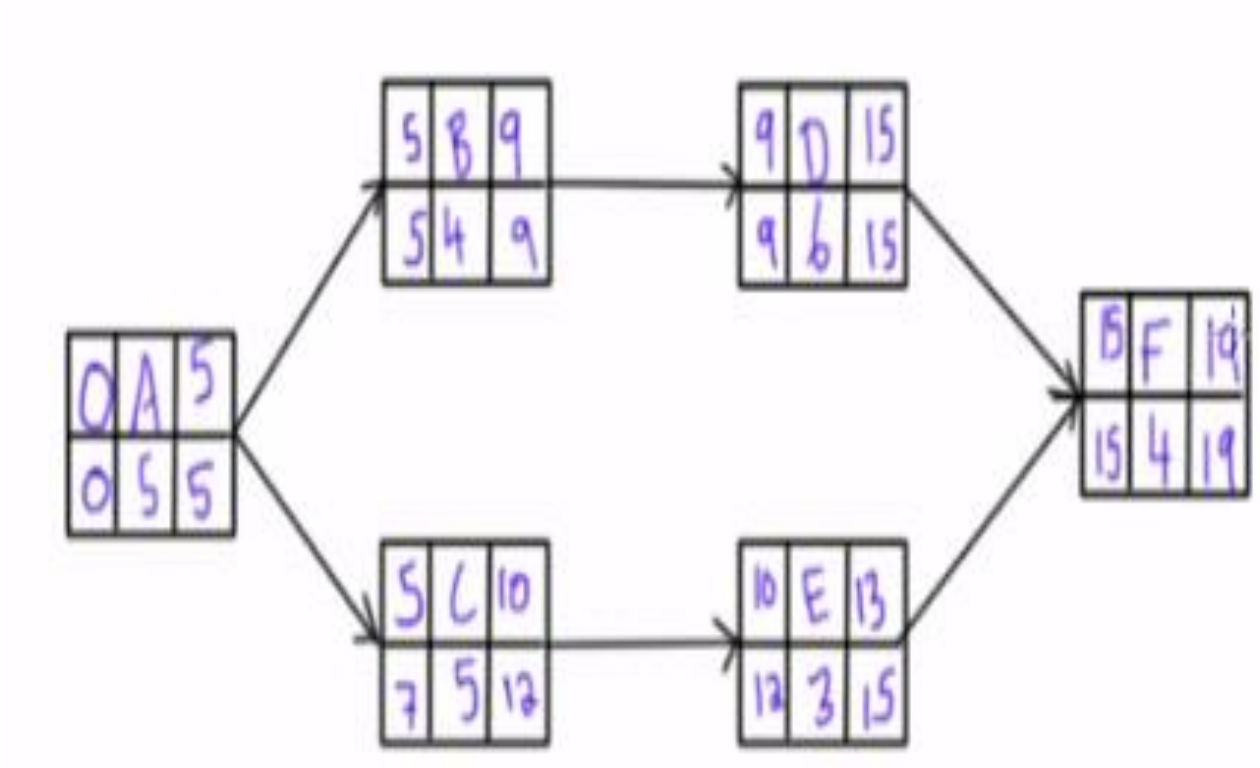
Example: Activity Network- Early Start and Early finish

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

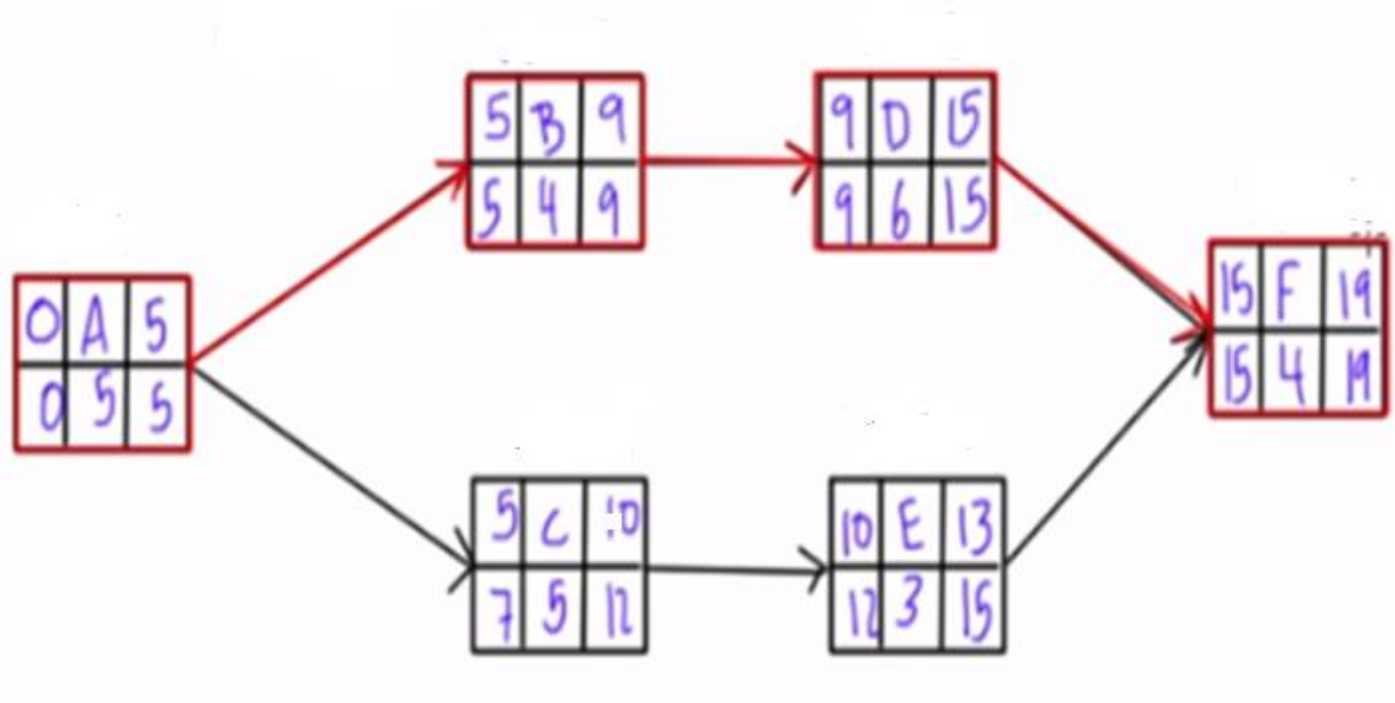


Example: Activity Network- Late Start and Late finish



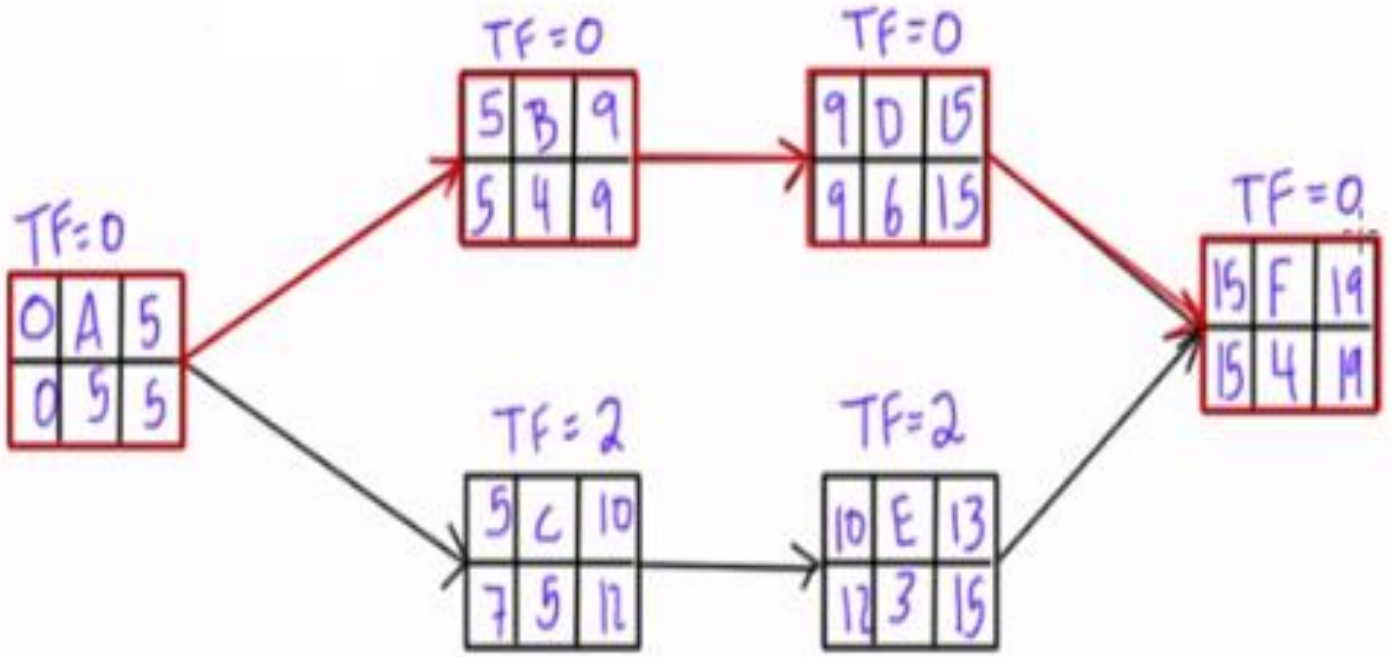


Example: Activity Network-Critical Path



Example: Activity Network- Total Float(Slack)

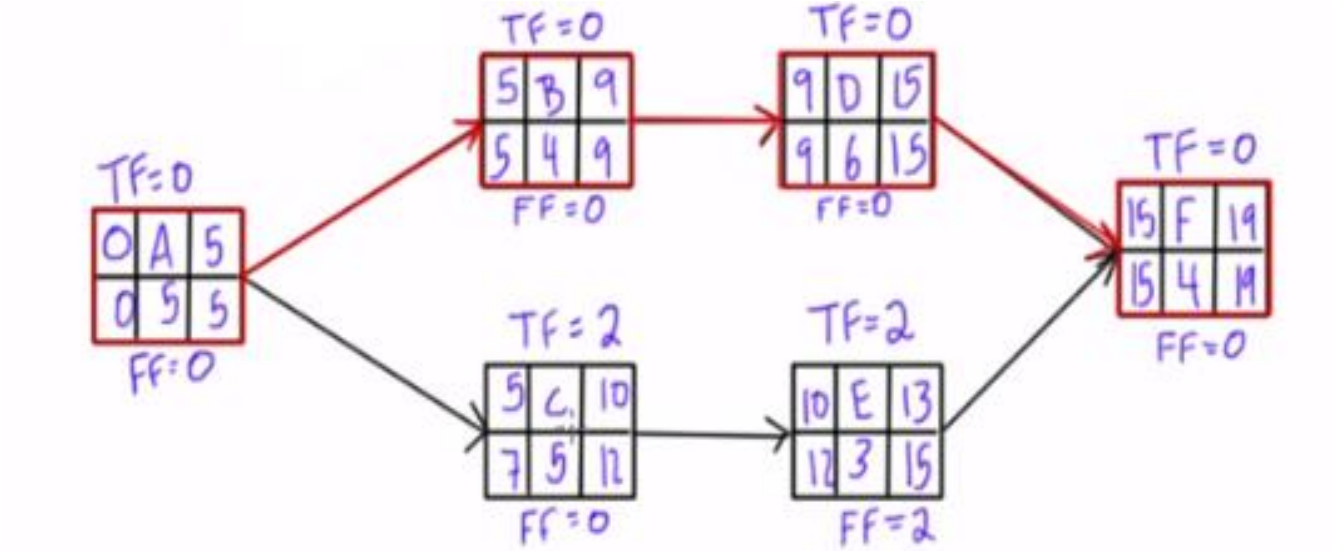
Total Float=TF
TF=LF-EF "Finish Float"
TF=LS-ES "Start Float"



Example: Activity Network- Free Float(Slack)

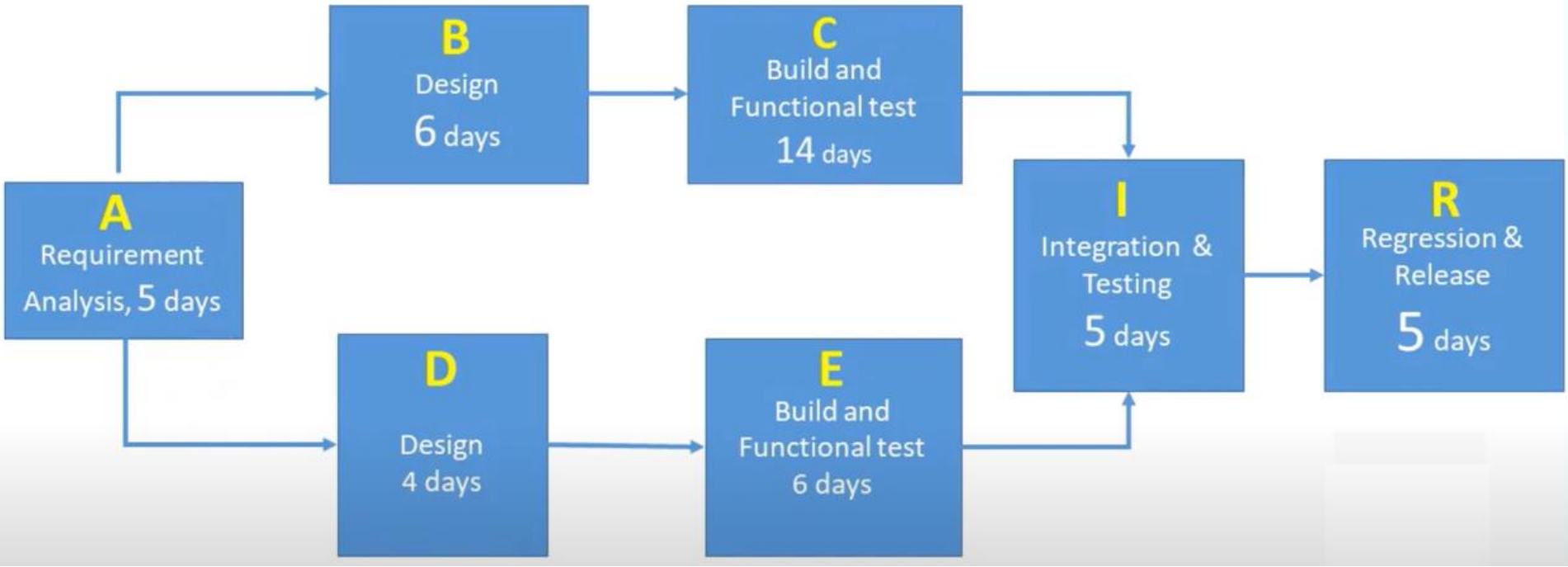
Free Float = FF = Minimum $ES_{successors}$ − $ES_{Activity}$ − $Duration_{Activity}$

FF ≤ TF



Activity Description	Activity	Predecessor	Duration in days
Requirement Analysis	A	-	5
Design Feature-1	B	A	6
DesignFeature-2	D	A	4
Build and Functional test Feature-1	C	B	14
Build and Functional test Feature-2	E	D	6
Integration testing	I	C,E	5
Regression & Release	R	I	5

Activity	Predecessor	Duration in days
A	-	5
B	A	6
D	A	4
C	B	14
E	D	6
I	C,E	5
R	I	5

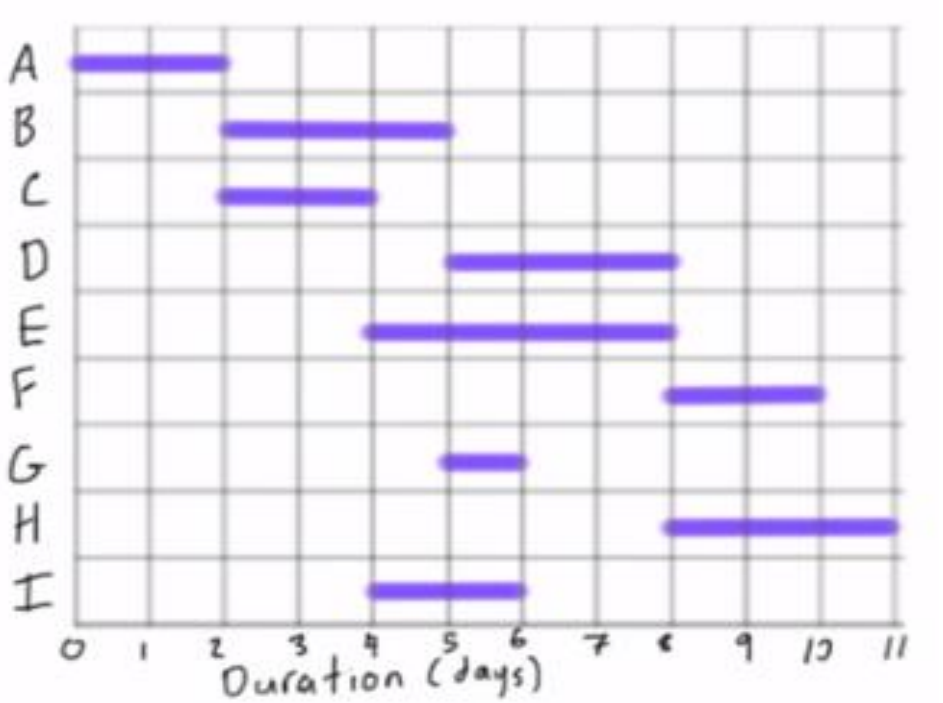

A
Requirement
Analysis, 5 days
B
Design
6 days
C
Build and
Functional test
14 days
D
Design
4 days
E
Build and
Functional test
6 days
I
Integration &
Testing
5 days
R
Regression &
Release
5 days

Gantt Chart

- Henry Gantt, an American mechanical engineer, designed the Gantt chart
- A Gantt chart is a graphical depiction of a project schedule. It's is a type of bar chart that shows the start and finish dates of several elements of a project that include resources, milestones, tasks, and dependencies..
- A Gantt chart helps in scheduling, managing, and monitoring specific tasks and resources in a project.
- The chart is the most widely used chart in project management.
- Horizontal bars of different lengths represent the project timeline, which can include task sequences, duration, and the start and end dates for each task. The horizontal bar also shows how much of a task requires completion.

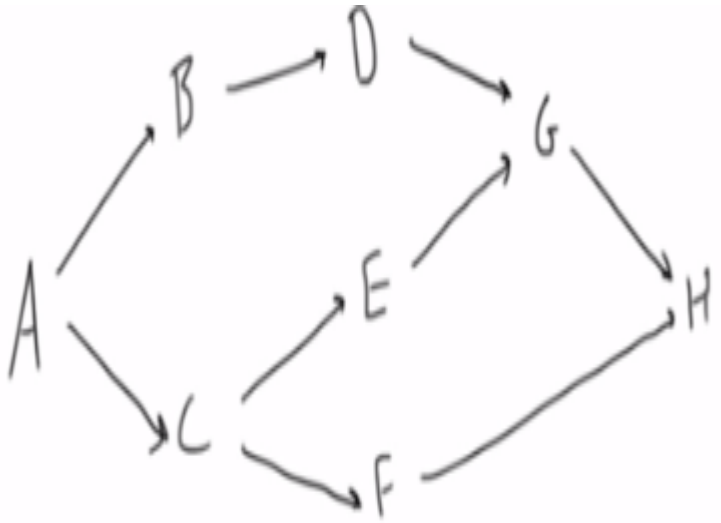
How to draw a Gantt chart

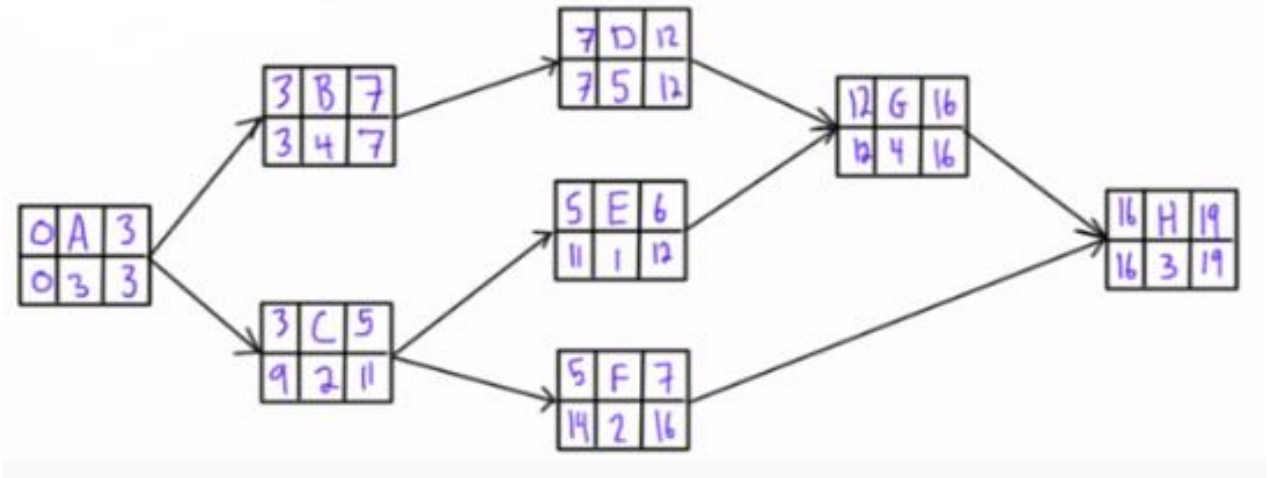
Activity	Predecessor	Duration
A	-	2
B	A	3
C	A	2
D	B	3
E	C	4
F	D	2
G	B	1
H	D	3
I	C	2



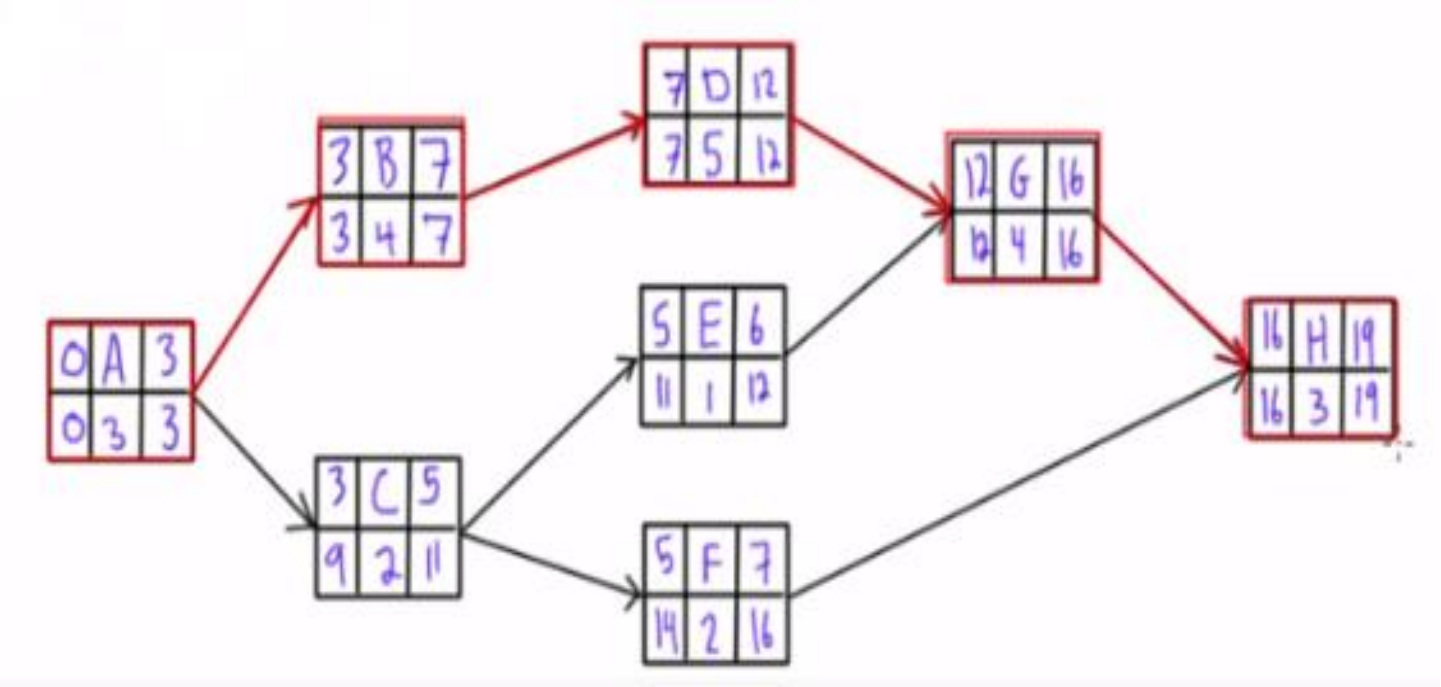
Another Example: Activity Network

Activity	Predecessor	Duration (days)
A	-	3
B	A	4
C	A	2
D	B	5
E	C	1
F	C	2
G	D,E	4
H	F,G	3





Another Example: Activity Network



Calculate the total float and free float of this example.
Also draw the Gantt chart.