SPM
Project Scheduling

Lecture # 34,35, 36
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# Introduction to Software Engineering
SE-110

Today's Outline

- **Software Project management**
  - o Project planning
  - o Project scheduling
  - o Risk management
- **Project Planning**
- **Project scheduling**
- **Activity network diagram**
- **CPM/CPA**

Software Project Management

- A sub-discipline of project management in which software projects are planned, monitored and controlled .

- Concerned with activities involved in ensuring that software is delivered on time and on schedule and in accordance with the requirements of the organisations developing and procuring the software.

Management

Project Management

Software Project Management
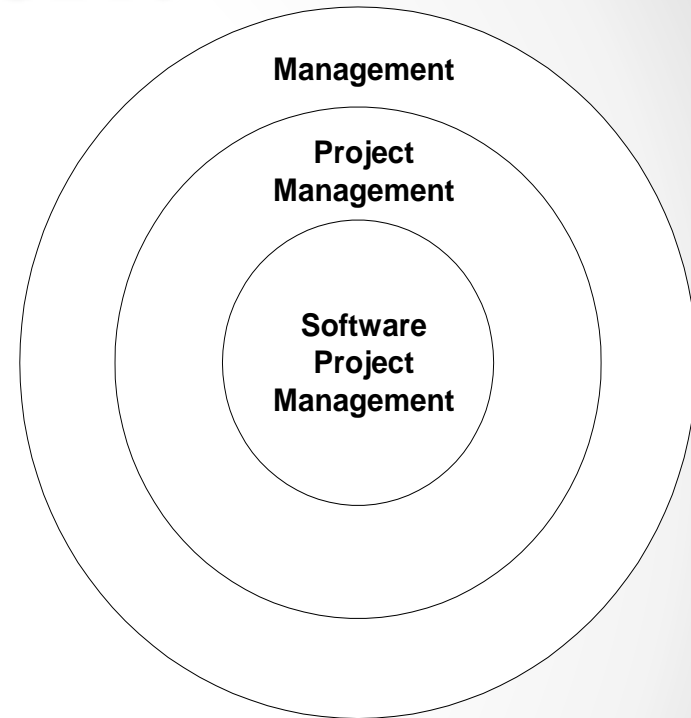
Software Project Issues

- Project management is needed because software development is always subject to budget and schedule constraints that are set by the organisation developing the software.

- Almost 70% of software organization have no defined engineering methods

- Software ends up
    - o Late
    - o Over budget
    - o Fails to meet requirements
    - o In a 1998 survey, 26% of software projects failed outright, 46% experienced cost and schedule overruns

- The major reason of theses software projects are not technical problems, but management problems"

Project Management....

Work Smart Not Hard !!!

Activities & Time Planning

- **Why do we need to plan our activities or have an activity plan?**

Project Planning

Planning Process

Devising and maintaining a workable scheme to accomplish the business need that the project was undertaken to address.

e.g. WBS

Work Breakdown Structure (WBS)

- **The Work Breakdown Structure is the foundation for effective project planning, costing and management.**

- **It is the most important aspect in setting-up a Project**

- **A Work Breakdown Structure (WBS) is a hierarchical (from general to specific) tree structure of deliverables and tasks that need to be performed to complete a project."**

- It is the foundation on which everything else builds

5 reasons to create a Work Breakdown Structure

- It helps with correct project organization.

- Assists in describing the project scope to stakeholders.

- Helps to distribute responsibilities.

- Shows the project's milestones and all the points to control.

- Allows estimating costs, risks and time correctly.

WBS

- There are many ways of breaking down the activities in a project, but the most usual is into:
- work packages;
- tasks;
- deliverables;
- milestones.

Displaying the WBS
Example of outlined WBS.

| Project Name			
	Task 1		
		Subtask 1.1	
			Work Package 1.1.1
			Work Package 1.1.2
		Subtask 1.2	
			Workpackage 1.2.1
			Workpackage 1.2.2
	Task 2		
		Subtask 2.1	
			Workpackage 2.1.1
			Workpackage 2.1.2

Displaying the WBS
Example of outlined WBS.

```
0.0 Retail Web Site
1.0 Project Management
2.0 Requirements Gathering
3.0 Analysis & Design
4.0 Site Software Development
        4.1 HTML Design and Creation
        4.2 Backend Software
                4.2.1 Database Implementation
                4.2.2 Middleware Development
                4.2.3 Security Subsystems
                4.2.4 Catalog Engine
                4.2.5 Transaction Processing
        4.3 Graphics and Interface
        4.4 Content Creation
5.0 Testing and Production
```

Displaying the WBS
Example of Chart WBS.
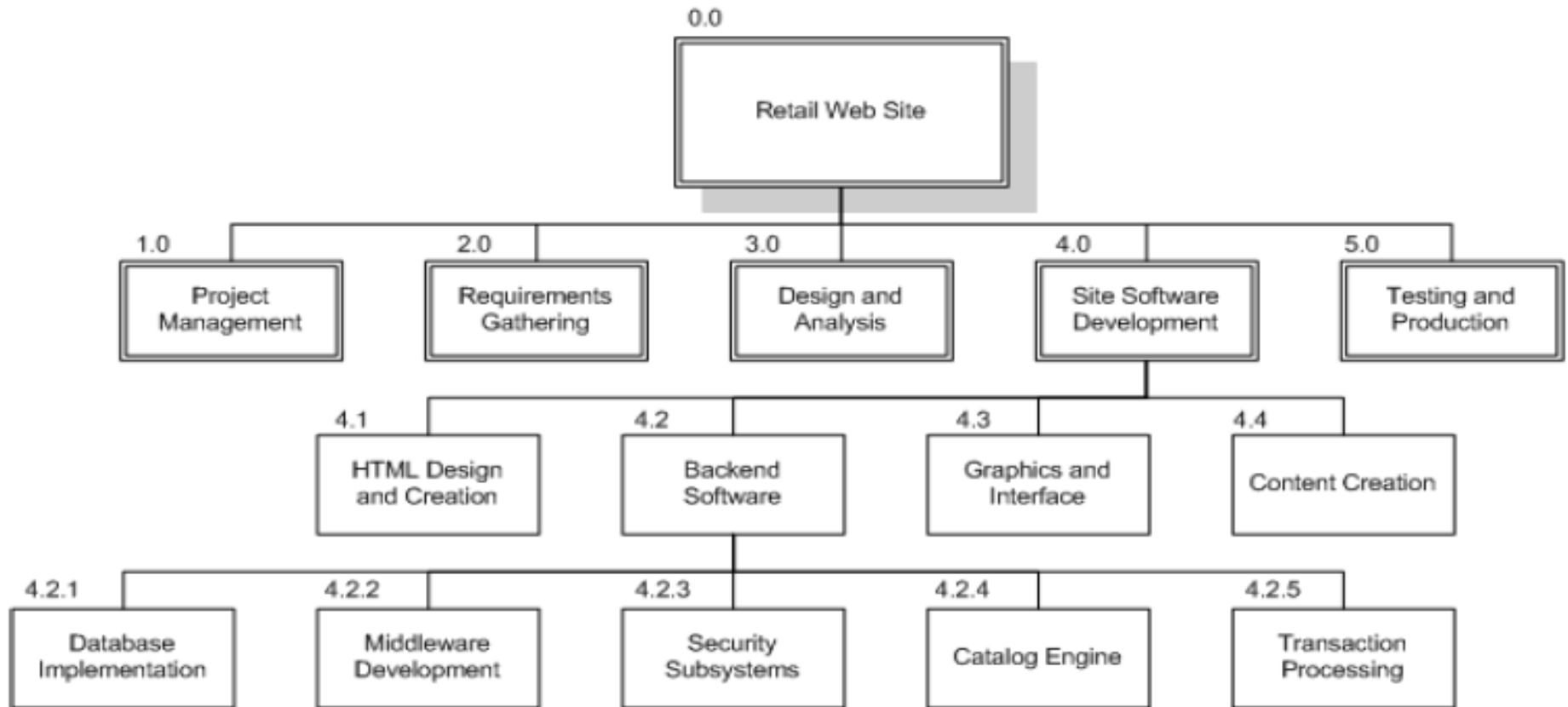
WBS– House Construction
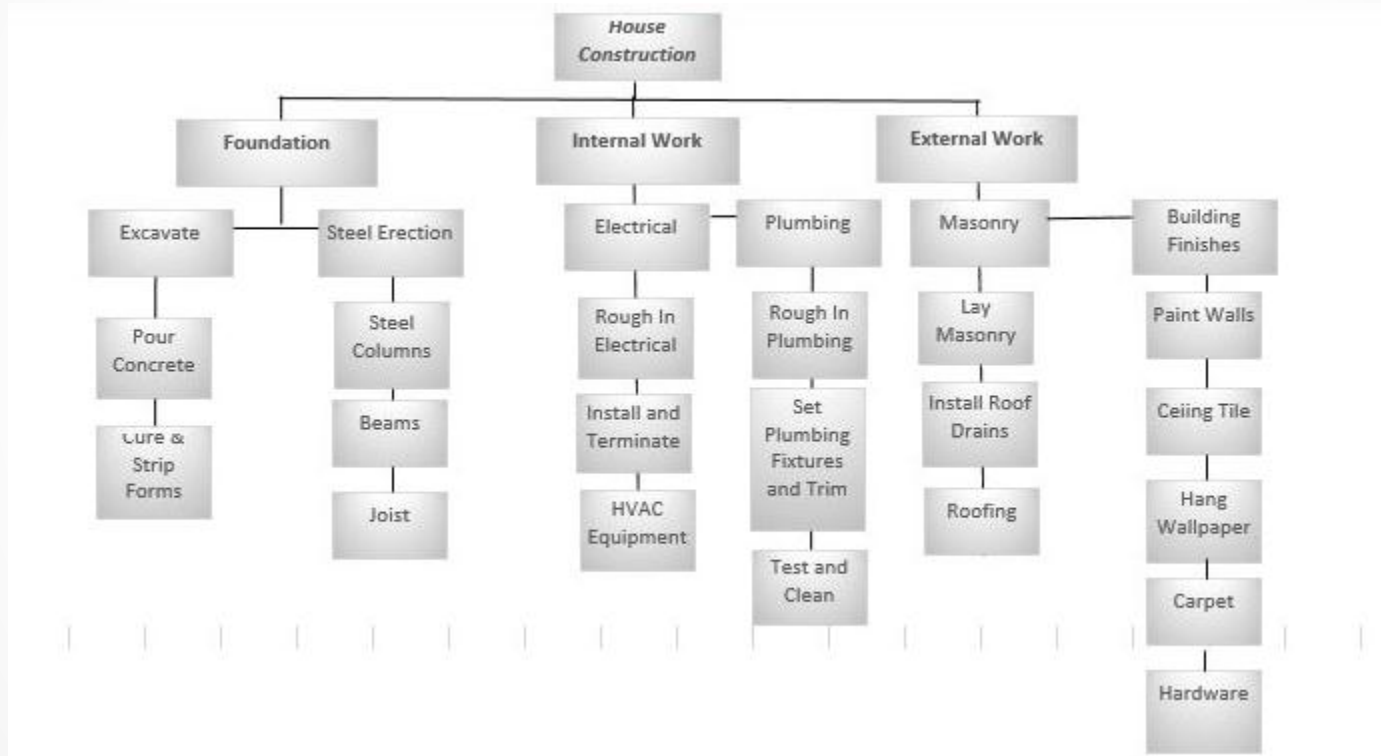
Example: WBS for Event Planning

- Using WBS, you can describe and divide tasks as follows:

- Planning: supervision, budget planning, approval and reconciliation, coordination issues.

- Catering: menu, shopping, cooking, serving.

- Area and activities: area tables and chairs, utensils, decorations and equipment.

- Participants/guests: invitations, guest list, RSPV, special needs.

- Staff: drivers, cooks, servers, hosts, cleanup.

- Entertainer: invitation, logistic issues, playlist coordination.

Example WBS

- **Redecorate Room**
  - **Prepare materials**
    - **Buy paint**
    - **Buy a ladder**
    - **Buy brushes/rollers**
    - **Buy wallpaper remover**
  - **Prepare room**
    - **Remove old wallpaper**
    - **Remove detachable decorations**
    - **Cover floor with old newspapers**
    - **Cover electrical outlets/switches with tape**
    - **Cover furniture with sheets**
  - **Paint the room**
  - **Clean up the room**
    - **Dispose or store left over paint**
    - **Clean brushes/rollers**
    - **Dispose of old newspapers**
    - **Remove covers**

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
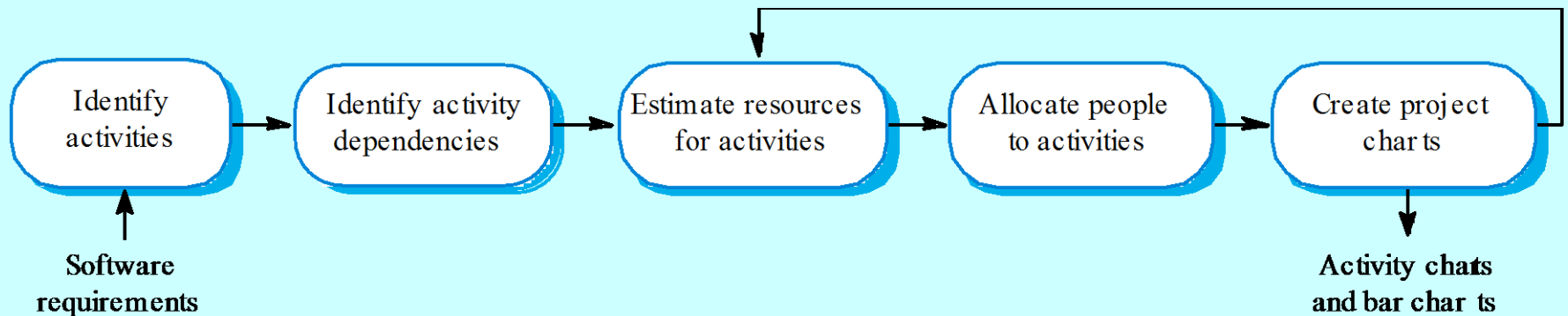
Scheduling Problems

- 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

- Model the project's activities and their relationships as a network

- In the network, time flows from left to right

- Originally techniques developed in the 1950s – 2 best known
    - CPM (Critical Path Method) or CPA (Critical Path Analysis)
    - PERT (Programme Evaluation Review Technique)

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.

Example: Activity Network

Activity	Predecessor	Duration
A	-	5
B	A	4
C	A	5
D	B	6
E	C	3
F	D,E	4
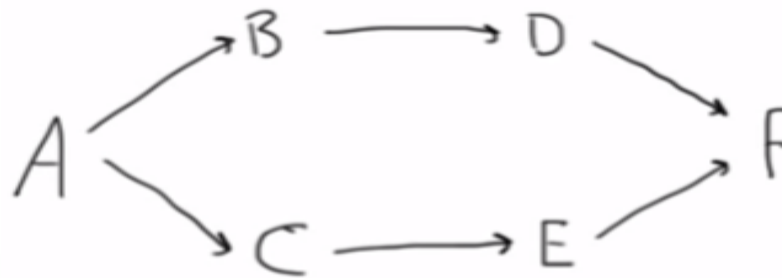
Example: Activity Network
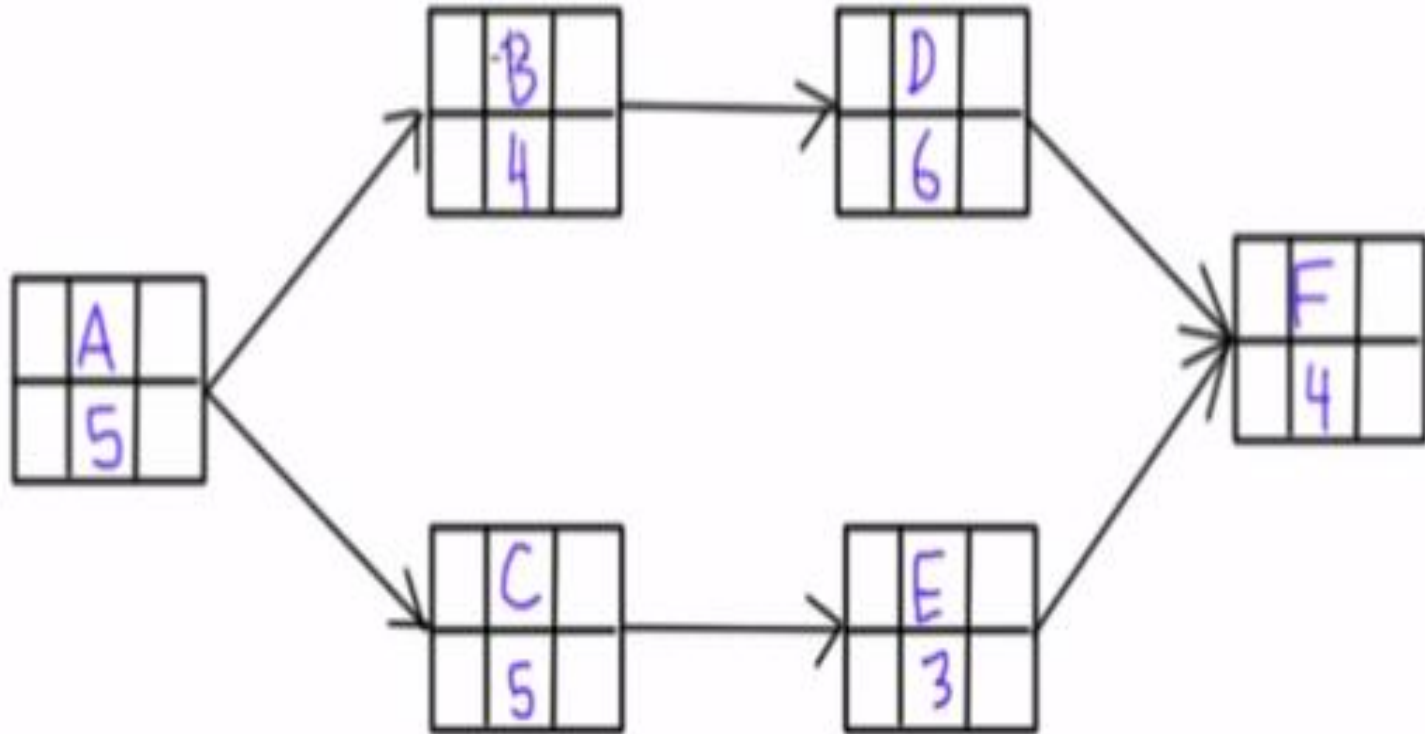
Some Definitions

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.

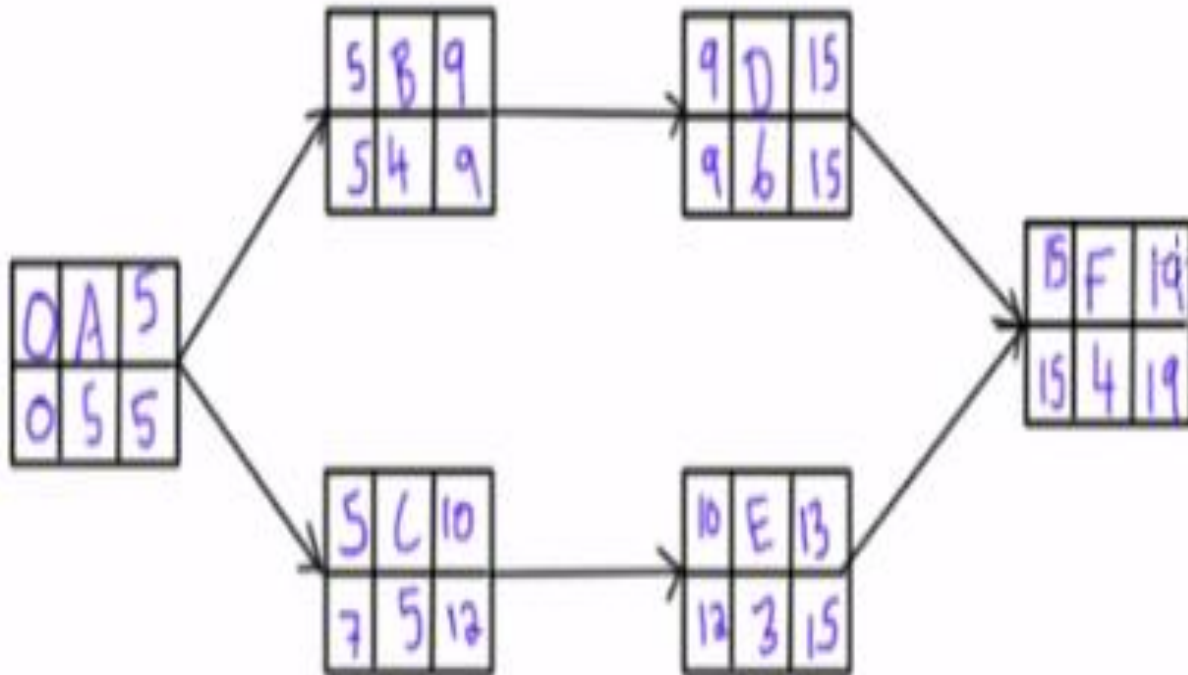# Example: Activity Network- Early Start and Early finish

Activity	Predecessor	Duration
A	-	5
B	A	4
C	A	5
D	B	6
E	C	3
F	D,E	4
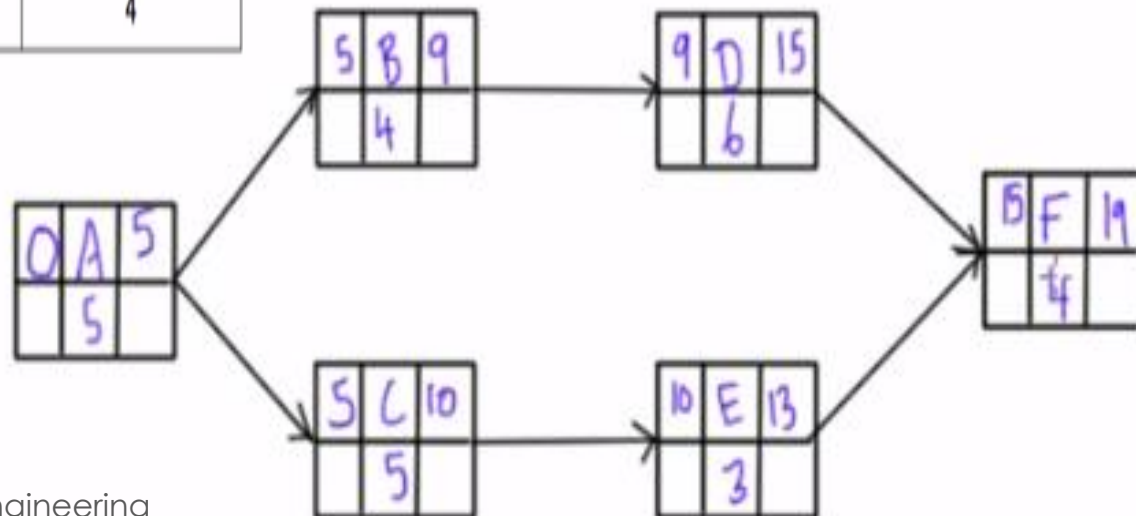
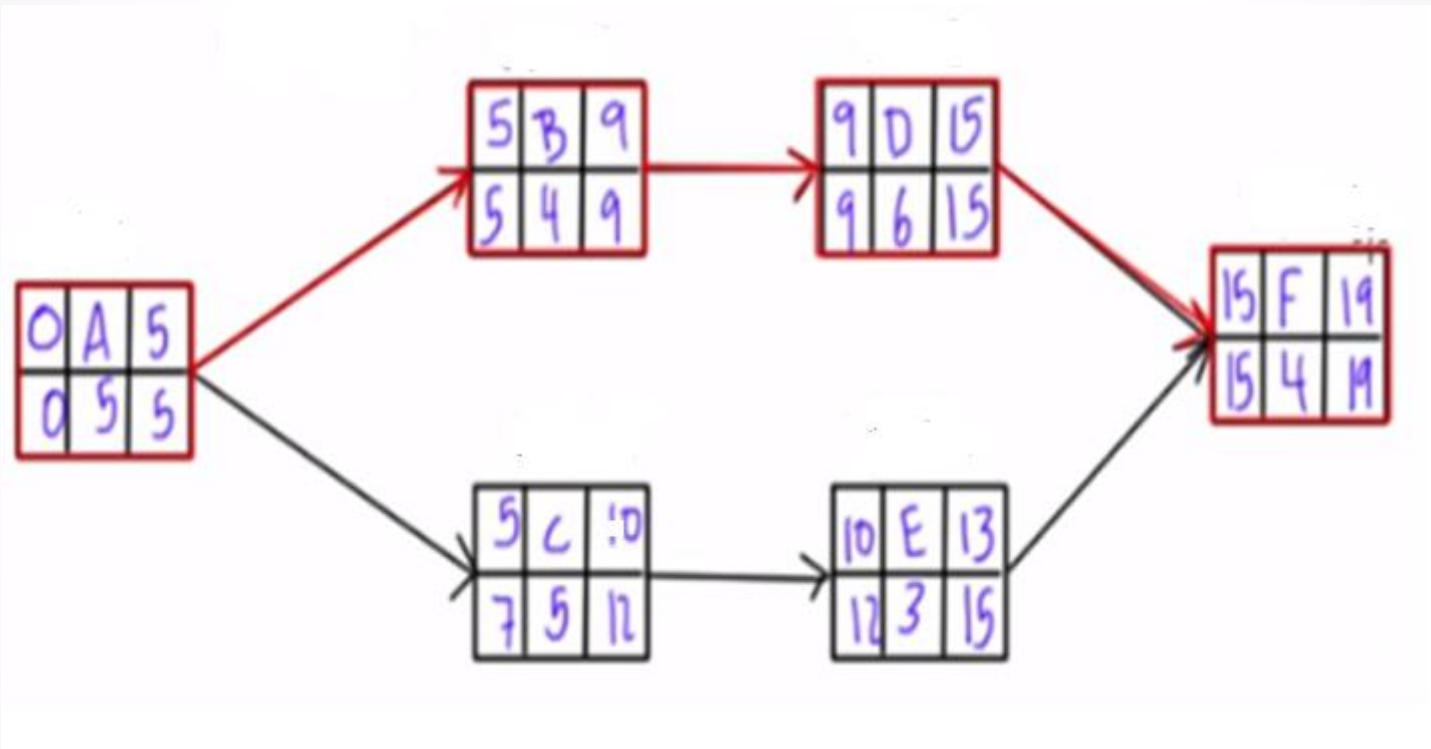# Example: Activity Network-Late Start and Late finish

Example: Activity Network-Critical Path
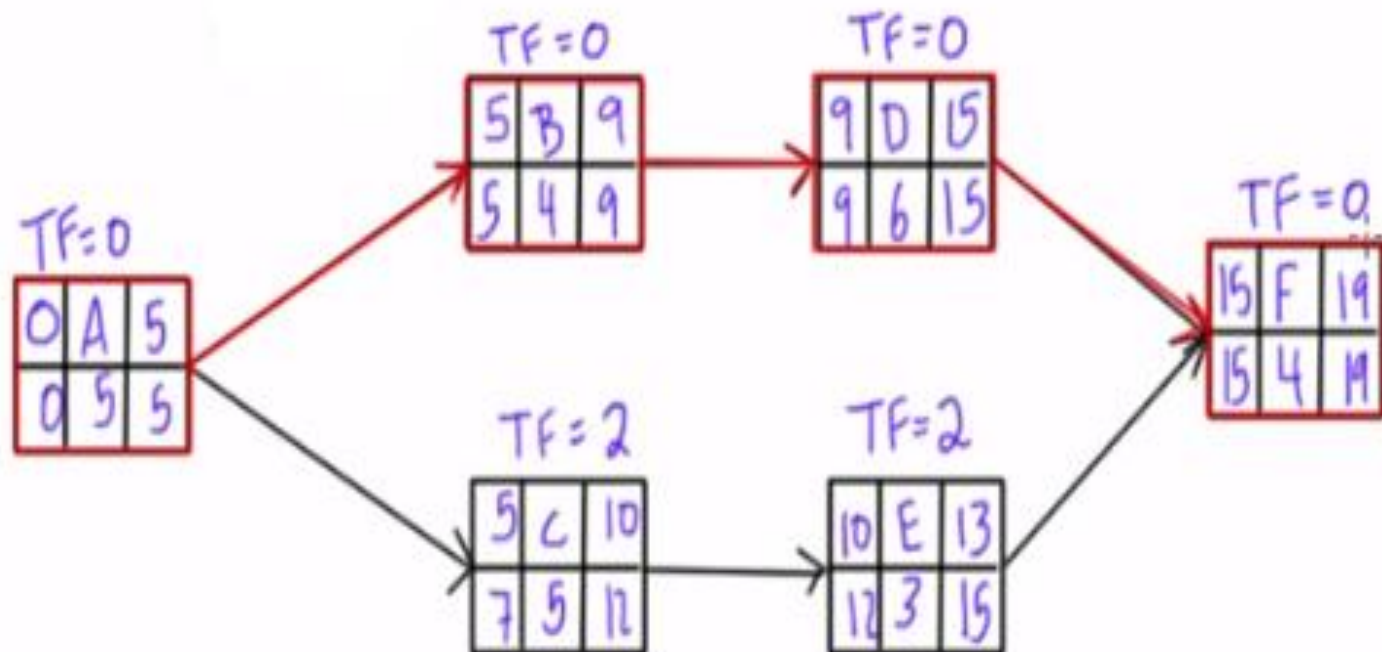
Example: Activity Network- Total Float(Slack)

Total Float=TF

TF=LF-EF   "Finish Float"

TF=LS-ES   "Start Float"
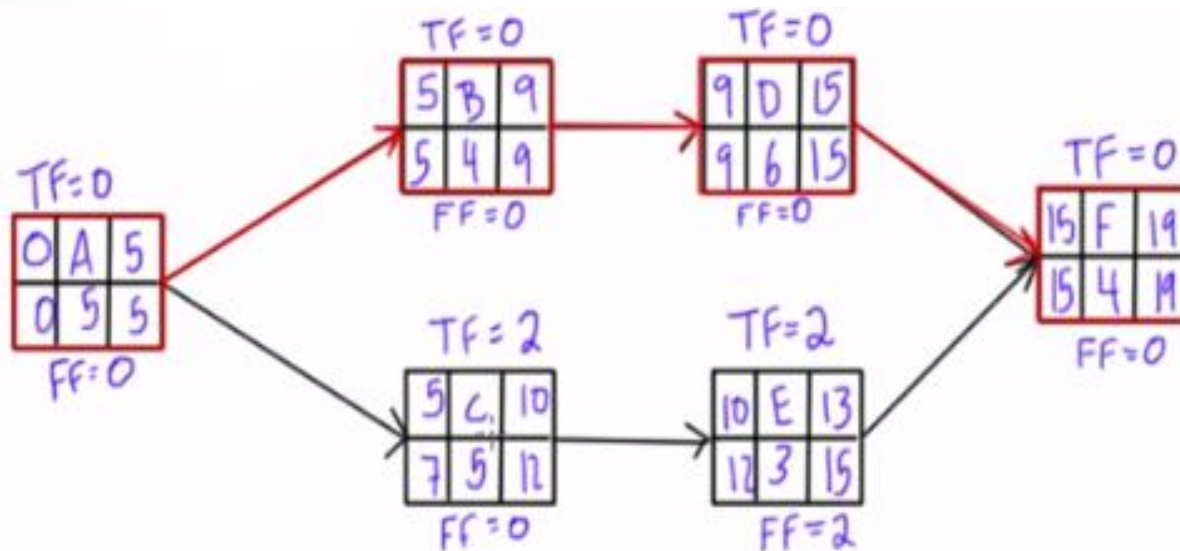
Example: Activity Network-Free Float(Slack)

$$\text{Free Float} = FF = \text{Minimum } ES_{\text{successors}} - ES_{\text{Activity}} - \text{Duration}_{\text{Activity}}$$

$$FF \leq TF$$

| TF		
ES	Act	EF
LS	dur	LF
	FF	

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.
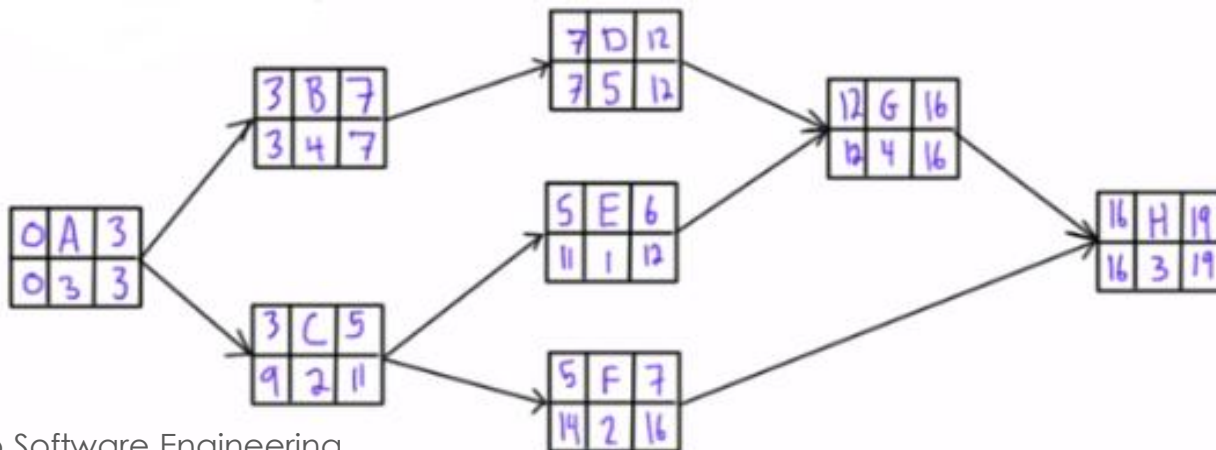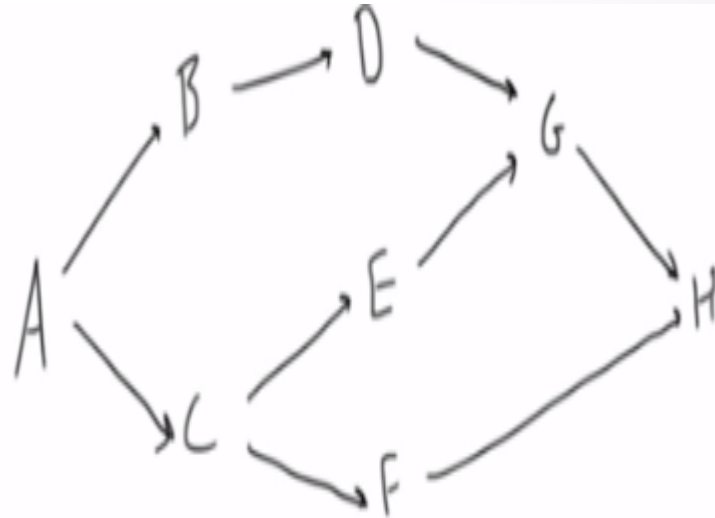
How to draw a Gantt chart

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
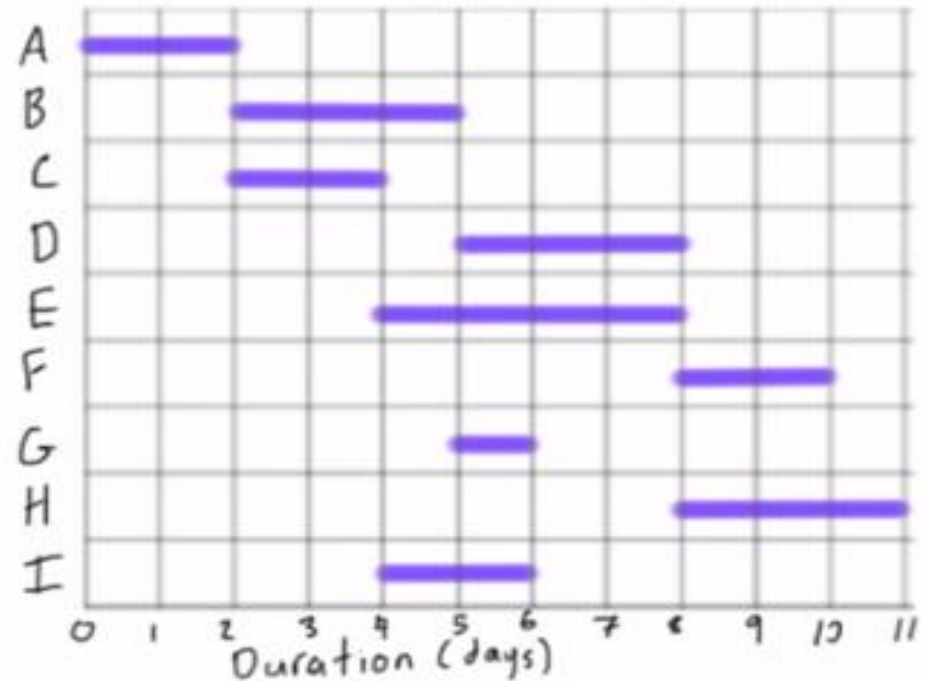
Another Example: Activity Network

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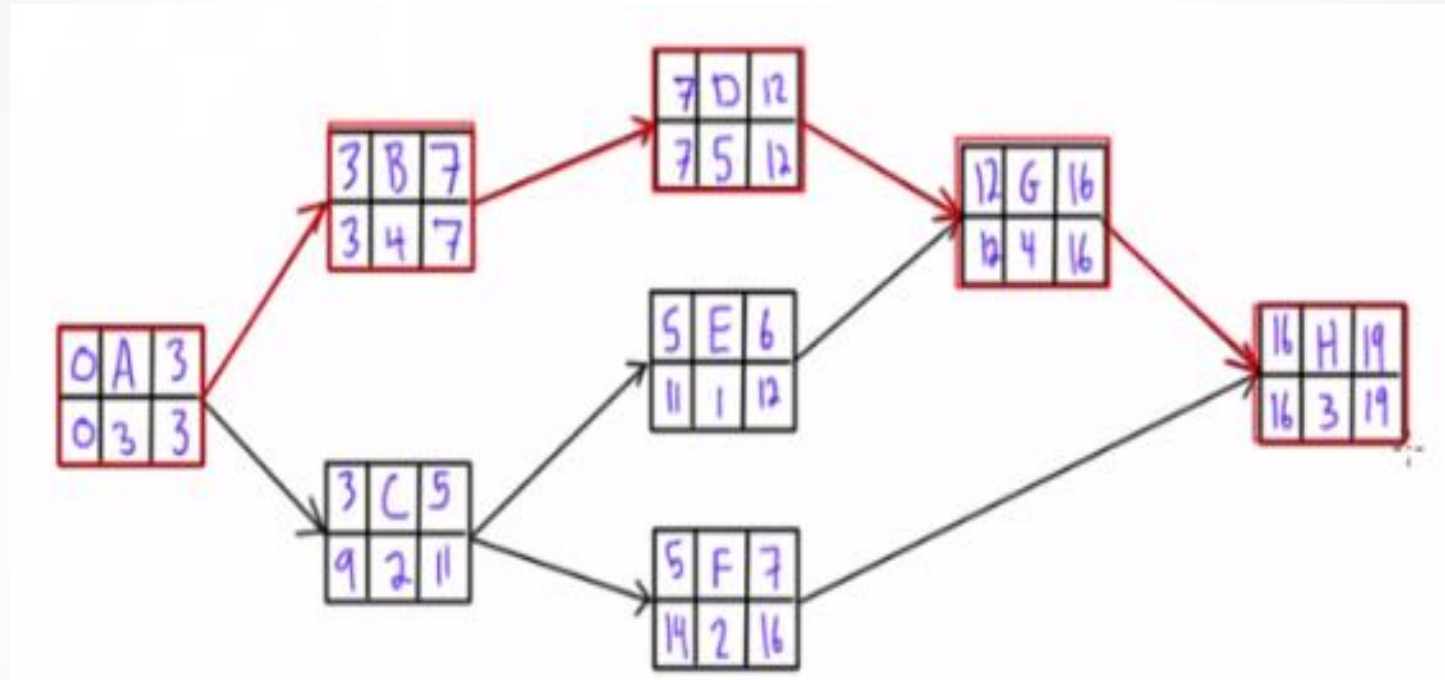
Calculate the total float and free float of this example.
Also draw the Gantt chart.

That is all