UNIT – 5

Activity Planning

Introduction

- Produce an activity plan for a project.
- Estimate the overall **duration**.
- To be effective, a **plan must be stated** as a set of **targets,** the achievements or non-achievements of which can be unambiguously measured.

The objectives of activity planning

1. **Feasibility assessment**—Is the project possible within required timescales and resource constraints?
2. **Resource allocation** –What are the most effective ways of allocating resources to the project ?
3. **Detailed Costing**—How much will the project cost and when is the expenditure likely to take place?
4. **Motivation—**Monitor achievement against targets is an effective way of motivating staff.
5. **Coordination**—when does the staff in different dept. need to be available to work on a particular project and when does staff need to be transferred between projects/ or project teams?

Activity planning

- **Activity planning and scheduling** techniques place an emphasis on **completing the project** in a **minimum time** at an **acceptable cost**.

- One effective way of **shortening project duration** is to carry out **activities in parallel.**

When to Plan?

- Planning is an ongoing process of refinement.
  - Each iteration becoming more detailed and more accurate than the last.
- During the **feasibility study** and **project start-up**, the main purpose of planning will be done to:
  - estimate timescale
  - Assess risk- which interrupt target completion date.
  - Keeping within budget.
  - Activity plans for resource availability and cash flow control

When to plan...

- **Throughout the project**, until the final deliverable has reached the customer, monitoring and re-planning must continue to correct any drift that might prevent meeting time or cost targets.

Project Schedules

- Before work commences , the project plan must be developed-
  - **when each activity should start and finish?**
  - **When and how much resources required?**
- Once the plan has been refined to level of detail is called a **project schedule**.

- Project schedule has **4 main stages**.

1. Ideal activity plan—producing the plan is to decide **what activities** need to be **carried out** and in **what order** they are to be done.

Project Schedules-Four Stages...

2. Activity Risk Analysis—identifying potential problems.

3. Resource allocation—expected availability of resources.

4. Schedule Production—indicates planned start and completion dates and a resource requirements statement for each activity.

Projects and Activities

- **A project is:**
  - Composed of a number of **activities.**
  - May start when at least one of it's activities is ready to start.
  - Completed when all its activities are completed.

Projects and Activities...

- **Defining activities**
  - Must have clearly defined **start and end-points.**
  - Must have **resource requirements** that can be forecast: these are assumed to be constant throughout the project.
  - Must have a **duration** that can be forecast
  - May be dependent on other activities being completed first (**precedence requirements**)

Identifying activities

- There are **three approaches** to identify the activities.

1. **Activity-based approach.**
2. **Product-based approach.**
3. **Hybrid approach**.

1. Activity-based approach

- **Creating a list of all the activities in a project**—Brainstorming session involving the whole project team, analysis of similar past projects.

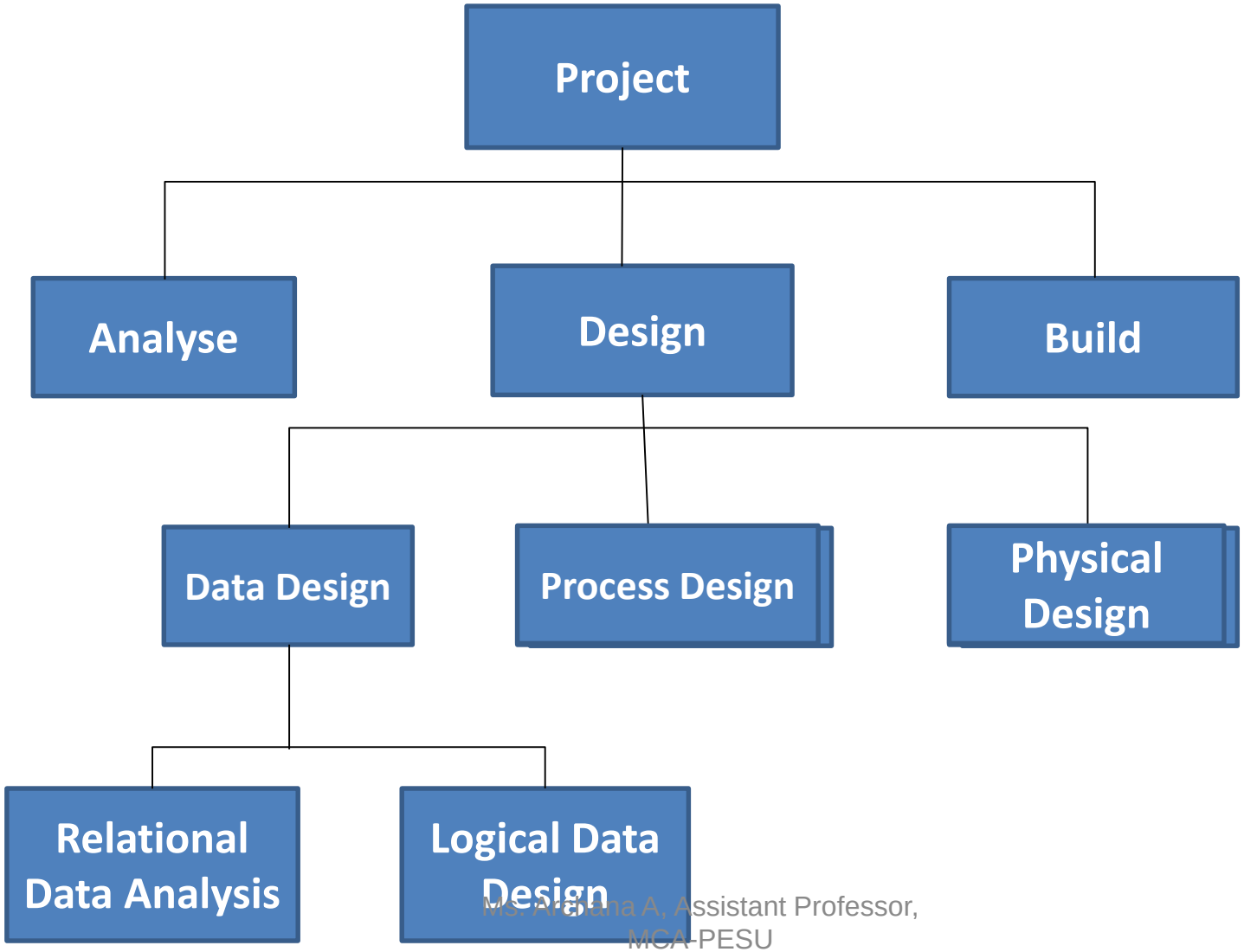
- Once the project's activities have been identified, then they **need to be sequenced** in the sense of deciding which activities need to be completed before others can start.

1.Actvity-based approach...

- Generate a task list to create a **work breakdown structure (WBS)** ---involves identifying main (high-level) task, then lower-level tasks by breaking main task.

- Figure shows a fragment of an activity-based Work Breakdown Structure.

A fragment of an activity-based Work Breakdown Structure.



2. Product-based Approach

- **List** the deliverable and intermediate products of project – **product breakdown structure (PBS).**

- **Identify the order** in which products have to be produced.

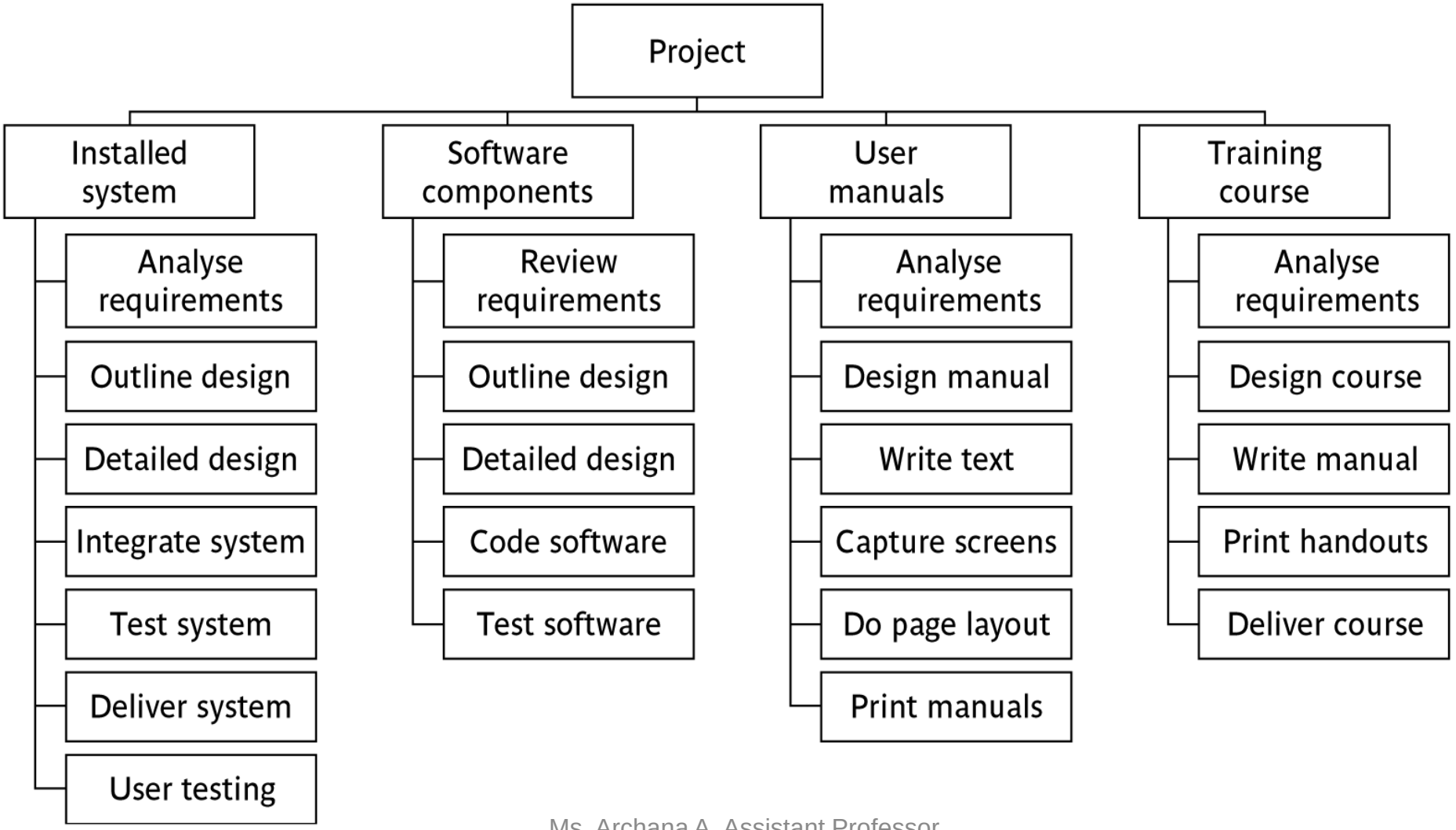
- **Work out the activities** needed to create the products.

3. Hybrid approach

- Structuring both **products and activities**.

- A set of activities required to produce the product is illustrated in fig , and is a flat **work breakdown structure(WBS)**—It would be beneficial to introduce additional levels.

3.Hybrid approach



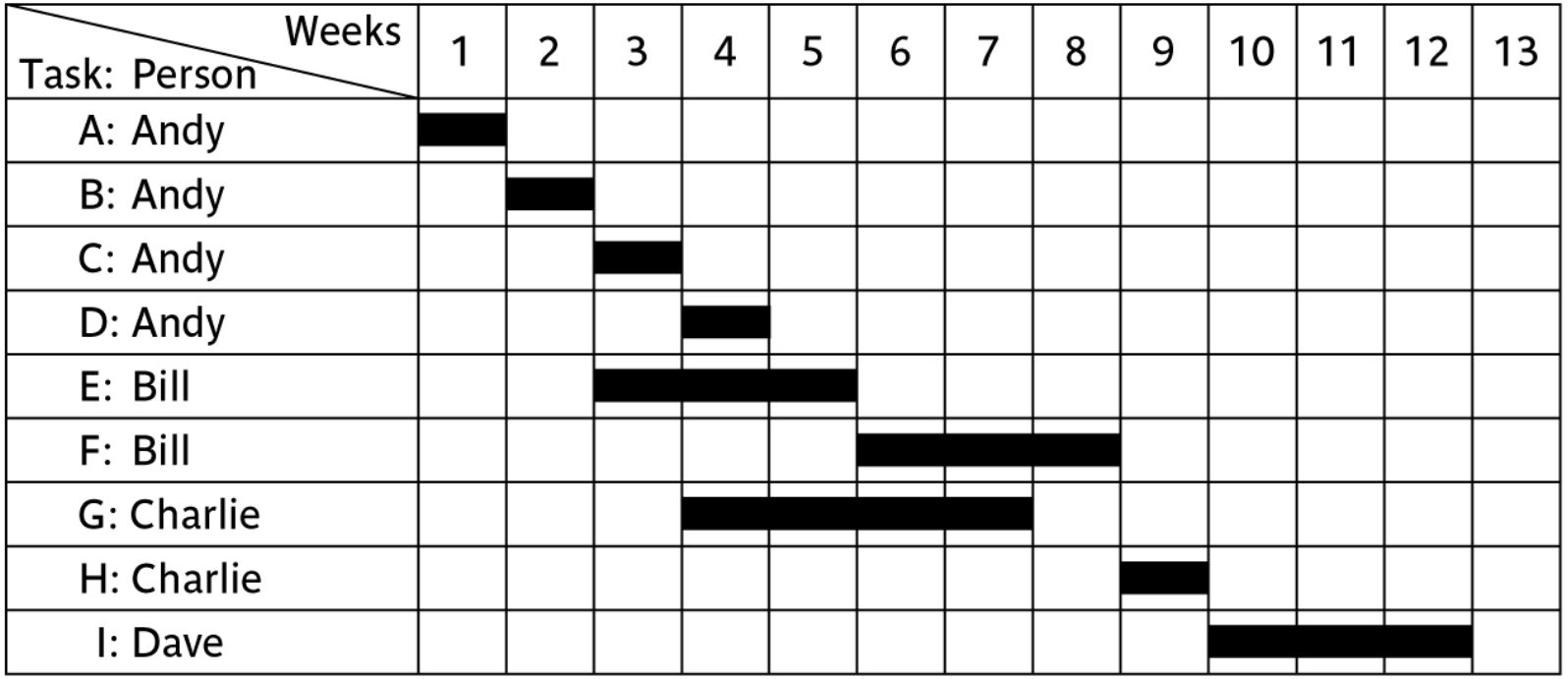
Sequencing and Scheduling Activities

- Throughout a project , we will require a schedule that clearly indicates **when each of the project's activities is planned** to occur and **what resources** it will need.

1. **Sequence** the tasks according to logical relationships.
2. Schedule them taking into account **resources** and other factors.

The final outcome of the planning process

A project plan as a bar chart



Activity key

A: Overall design
B: Specify module 1
C: Specify module 2
D: Specify module 3
E: Code module 1
F : Code module 3
G: Code module 2
H: Integration testing
I : System tesing

NETWORK PLANNING MODELS

Network Planning Models

- The project scheduling techniques model the project's activities and their relationships as a network . **Two important techniques** are

1. **CPM** (Critical Path Method)
2. **PERT**(Program Evaluation Review Technique)

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CPM and PERT are powerful tools/techniques that help to **schedule and manage complex projects.**

Network Planning Models…

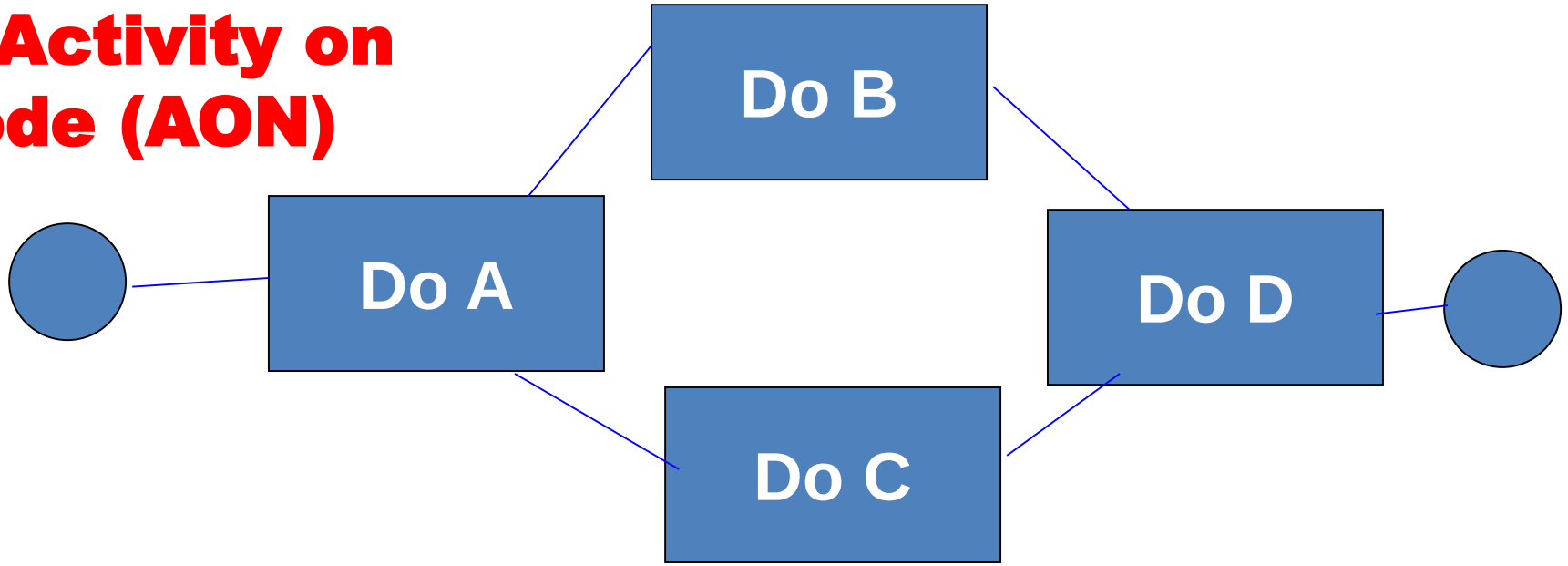
- Both the techniques used an ***activity-on-arrow*** approach to **visualizing the project as a network** where **activities** are drawn as **arrow** joining **circles** or **nodes**, which represent the possible **start** and /or **completion** of an activity or set of activities.

- A variation on these techniques, called **precedence networks** has become popular (*currently adopted in computer applications).*

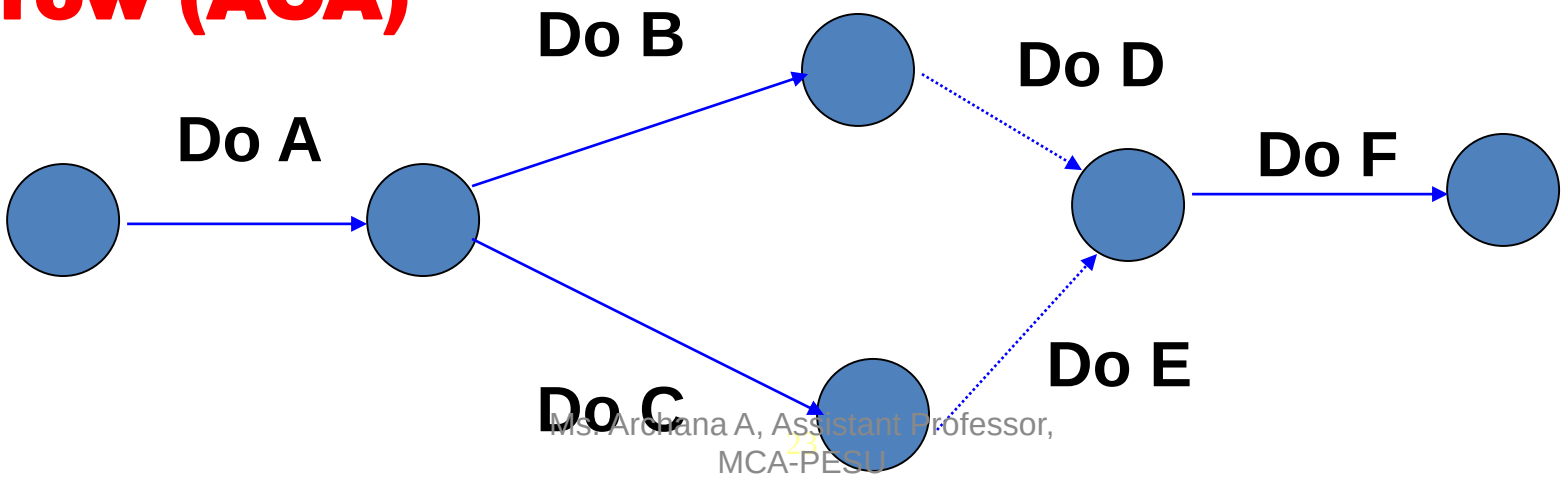
- This method uses ***activity-on-node*** networks where activities are represented as **nodes** and **links** between nodes represent **precedence** (or sequencing) **requirements**.

Approaches visualizing Project as Network

1. Activity on Node (AON)



2. Activity on Arrow (AOA)



Formulating Network Model

- A **network model** is to represent the **activities and their relationships as a graph.**
- Representing activities as nodes(boxes) in the graph,the lines between nodes represent dependencies.

Critical Path Method (CPM)

- **CPM** is a network diagramming technique used to predict total project duration.
- CPM is an analysis technique with three main purposes:
  - To calculate the project's finish date
  - To identify to what extent each activity in the schedule can slip (float) without delaying the project
  - To identify the activities with the highest risk that cannot slip without changing the project finish date

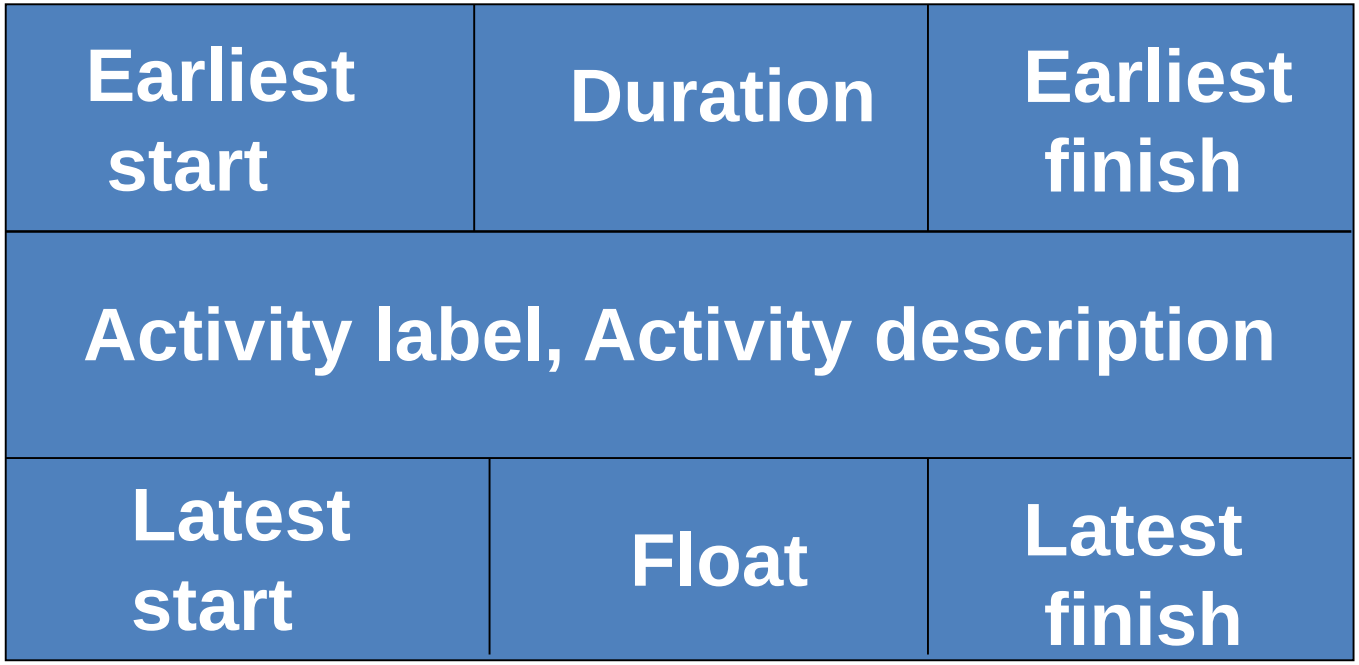
Critical Path Method (CPM)…

- How does Critical Path Method calculate the project's finish date?
  - Forward Pass Calculation
    - Calculates **Early Start and Early Finish** dates
  - Backward Pass Calculation
    - Calculates **Late Start and Late Finish** dates

Critical Path Method (CPM)…

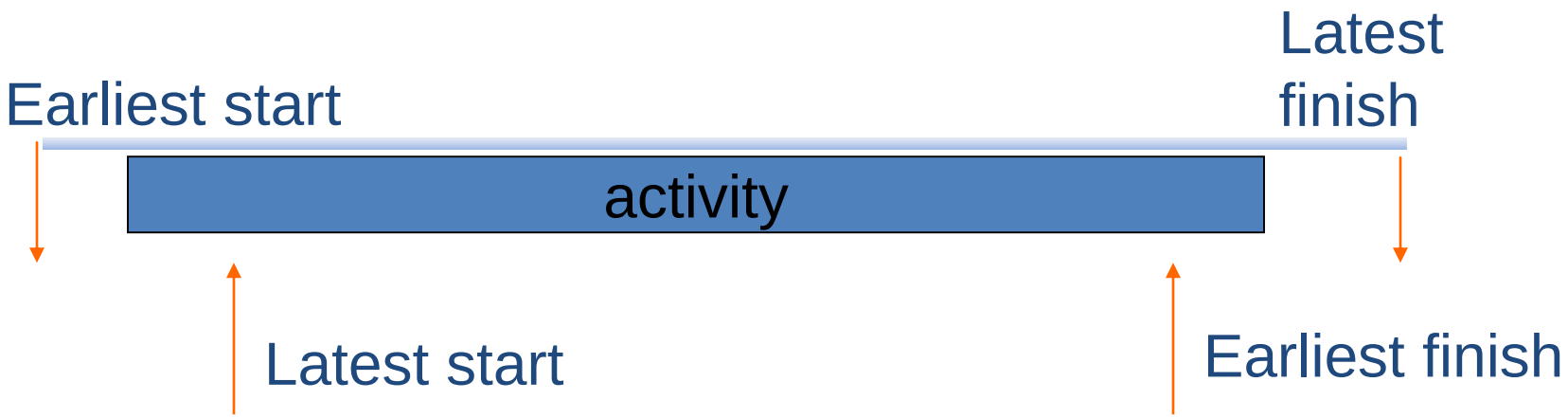
- **Early Start (ES)** is the earliest date a task can start.
- **Early Finish (EF)** is the earliest date a task can be completed.
- **Late Start (LS)** is the latest date a task can start without delaying the project end date.
- **Late Finish (LF)** is the latest date a task can finish without delaying the project end date.

Labelling Conventions



Activity label is a code , uniquely identify the activity.
Activity description –activity Name

Start and finish times



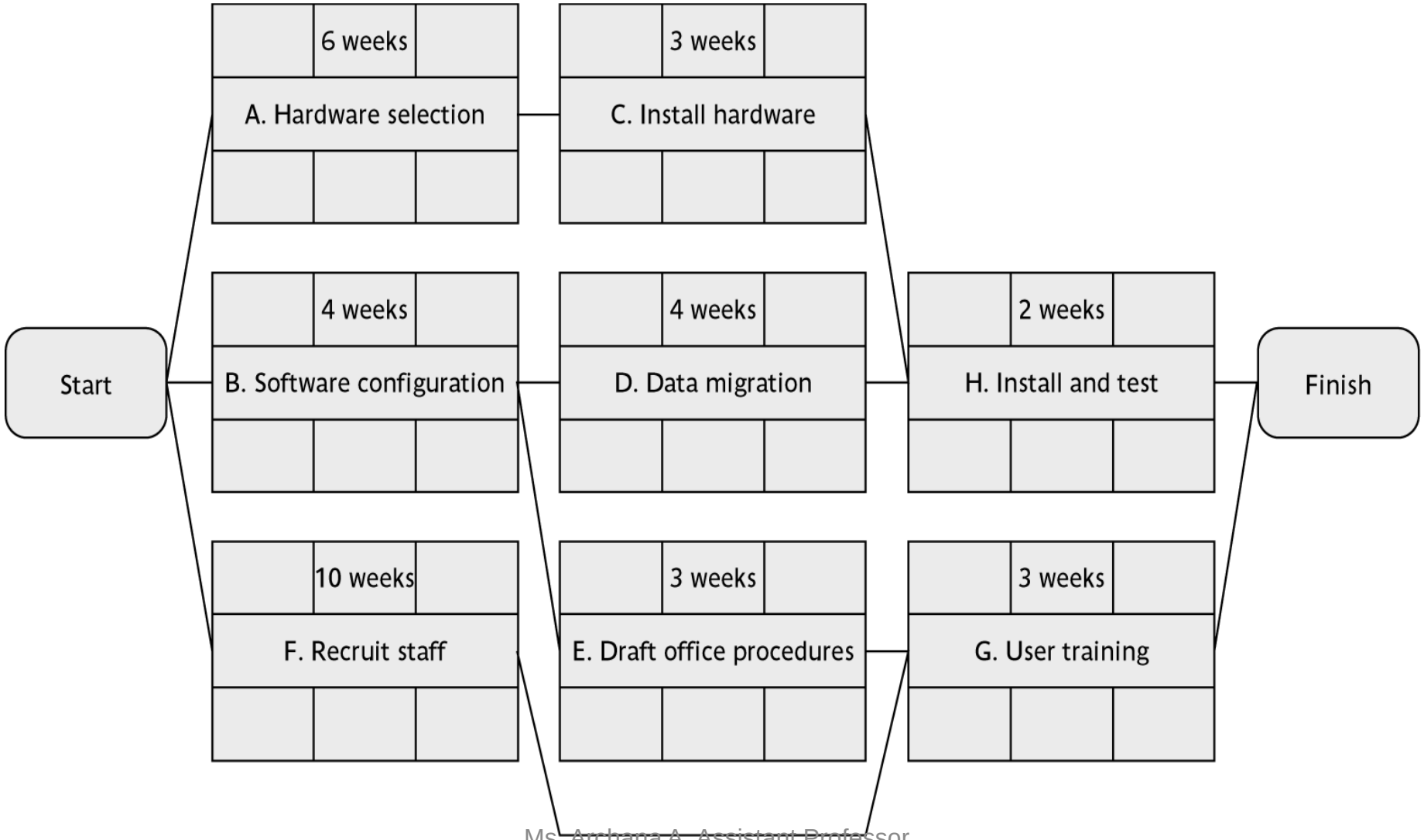
- Activity ‘write report software’
- Earliest start (ES)
- Earliest finish (EF) = ES + duration
- Latest finish (LF) = latest task can be completed without affecting project end
- Latest start (LS) = LF - duration

Adding the Time Dimension

An example project specification with estimated activity durations and precedence requirements

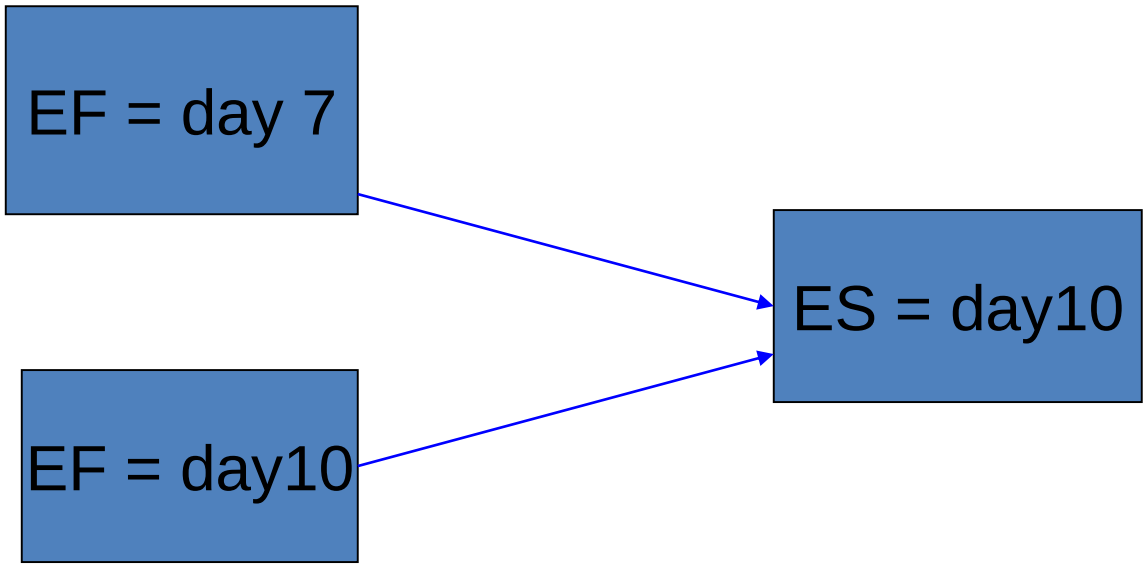
Activity	Duration(Weeks)	Precedents
A:Hardware Selection	6	
B:System Configuration	4	
C:Instal Hardware	3	A
D:Data migration	4	B
E:Draft office Procedures	3	B
F:Recruit staff	10	
G:User Training	3	E,F
H:Instal and test System	2	C,D

The precedence network for the example project

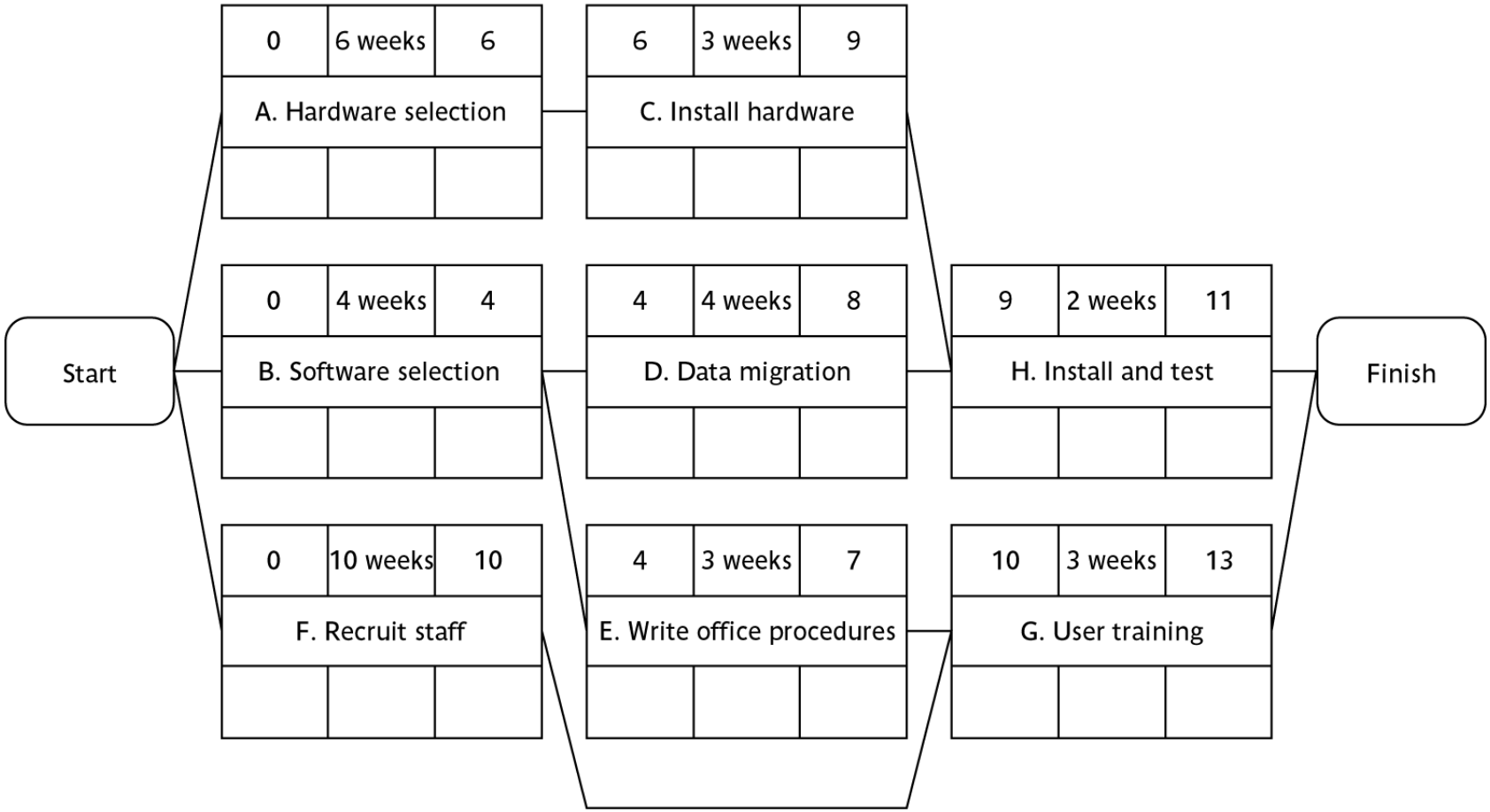


The Forward pass

- **The forward pass is carried out to calculate the earliest dates on which each activity may be started and completed.**
- Start at beginning (Day 0) and work forward following chains.
- Earliest start date for the *current* activity = earliest finish date for the *previous*.
- When there is more than one previous activity, take the *latest* earliest finish.



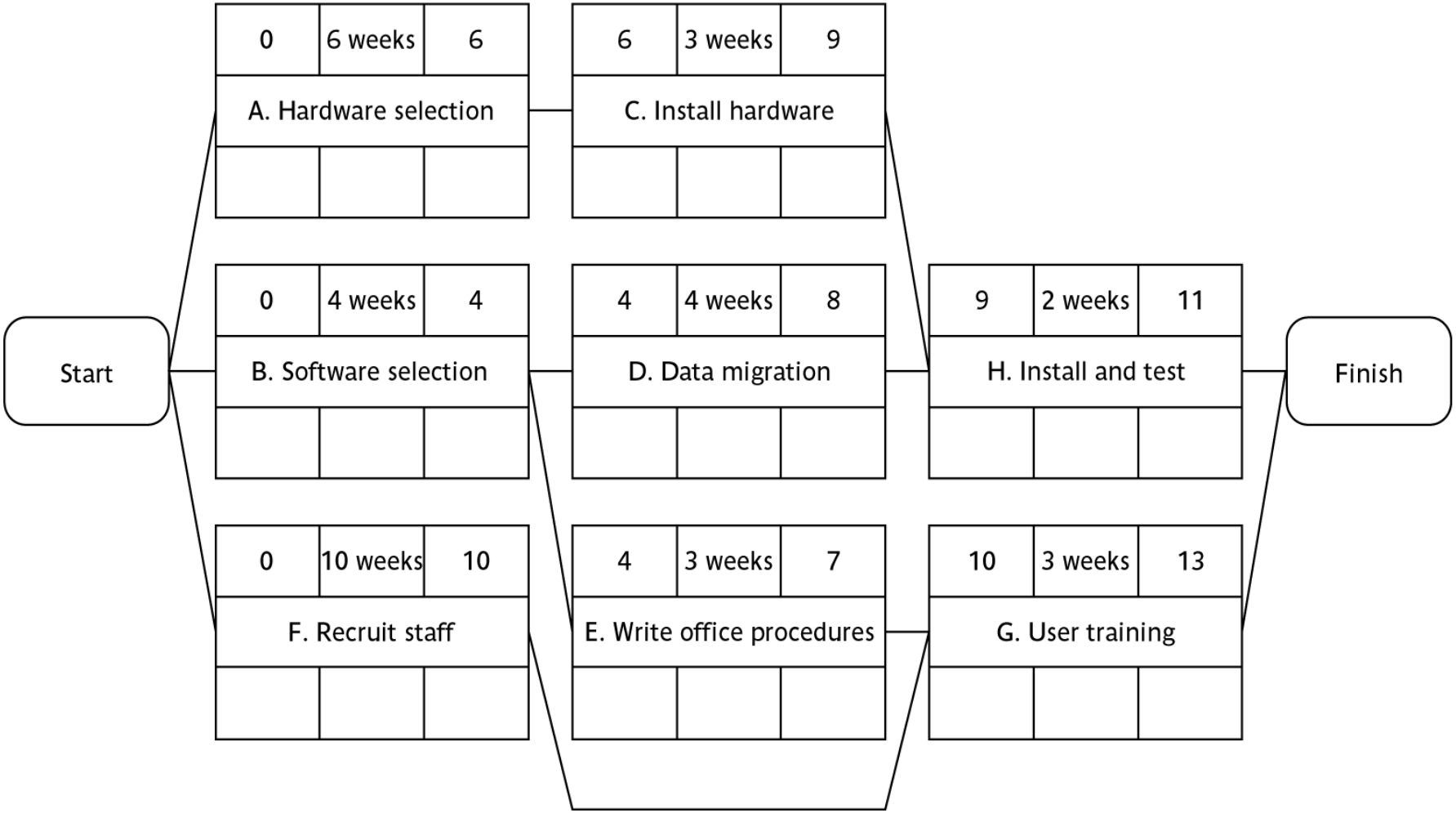
The Forward pass



The Backward pass

- To calculate the latest date at which each activity may be started and finished without delaying the end date of the project.
- Start from the *last* activity. work backwards.
- Latest finish (LF) for last activity = earliest finish (EF).
- Latest finish for *current* activity = Latest start for the *following*.
- More than one following activity - take the *earliest* LS.
- Latest start (LS) = LF for activity – duration.

Backward pass



Identifying the Critical path

- There will be at least one path through the network that defines the duration of the project. This is know as the **critical path**.
- The difference b/w an activity's earliest start (ES)date and its latest start (LS) date is known as the **activity's float**.(or float=EF-LF).
- Any activity **float=0 is critical**, ie any delay in carrying out the activity will delay the completion date of the project.
- There will always be at least one path through the network joining those critical activities—**critical path.**

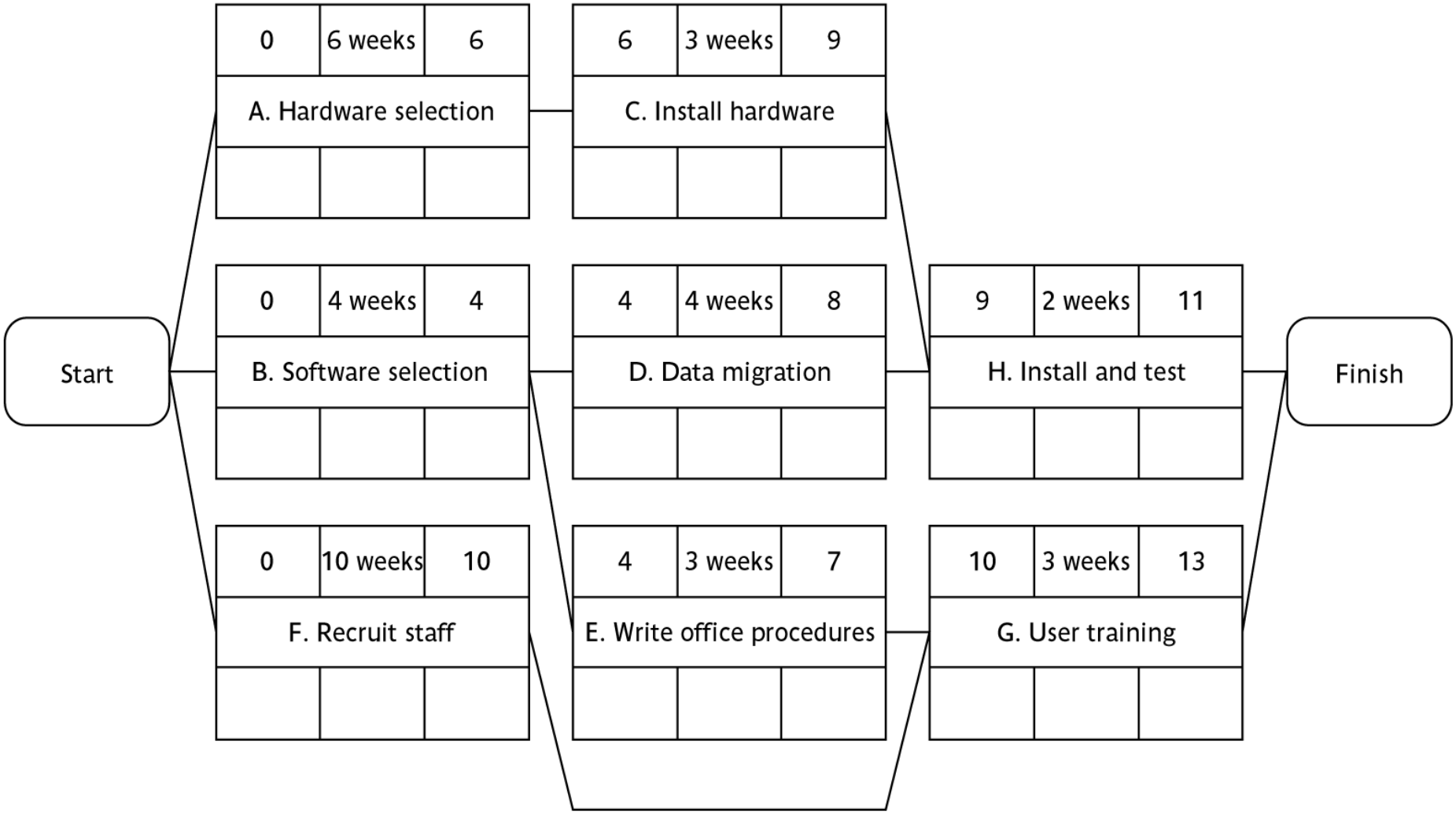
Significance of critical path

1. In **managing the project**, we must pay particular attention to monitoring activities on the critical path so that the effects of any delay or resource unavailability are detected and corrected at the earliest opportunity.
2. In **planning the project**, it is the critical path that we must shorten if we are to reduce the overall duration of the project.

critical path

- A **critical path** is the **sequence of** project network **activities** which add up to the longest overall duration, regardless if that longest duration has float or not. This determines the shortest time possible to complete the **project**.

1.Write float value and identify the critical path



Identifying the Critical path

- The critical path is the series of activities within the network with zero total float.
- There must be at least one critical path through any network. The path must be continuous but it may branch into a number of parallel paths.
- It is important to remember that a critical path can change during a project, as actual durations and dates vary.

Activity float

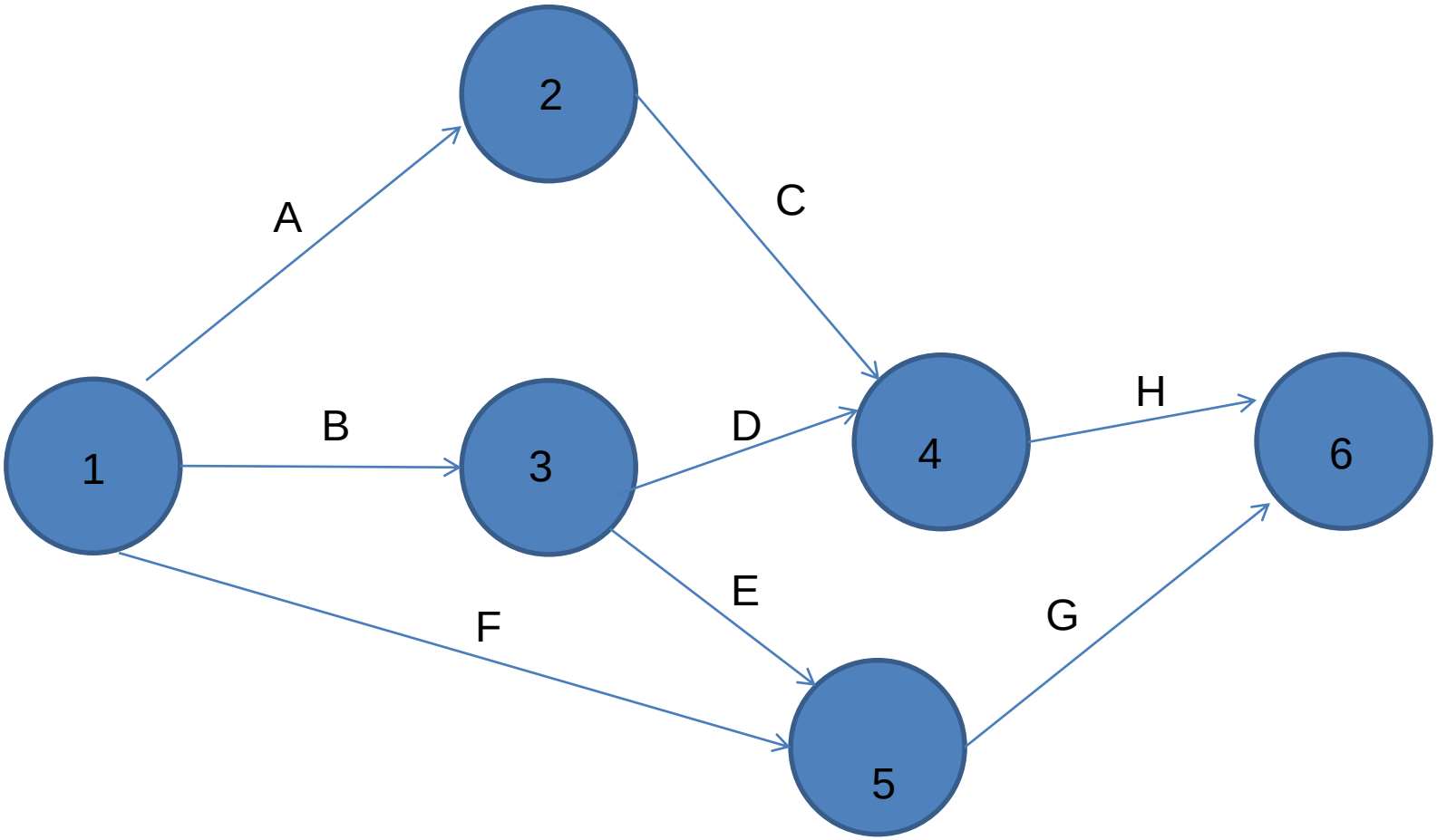
- **Total Float** is the amount of time that an activity can be delayed from its early start date without delaying the project finish date.
- **Free Float** is the amount of time that an activity can be delayed without delaying the early start date of any successor activity.
  - It is calculated as the **difference between the earliest completion date for the activity and the earliest start date of the succeeding activity.**

Shortening the project duration

- Reduce activity duration-applying more resources , working overtime, procuring additional staff.

Identifying the critical activities

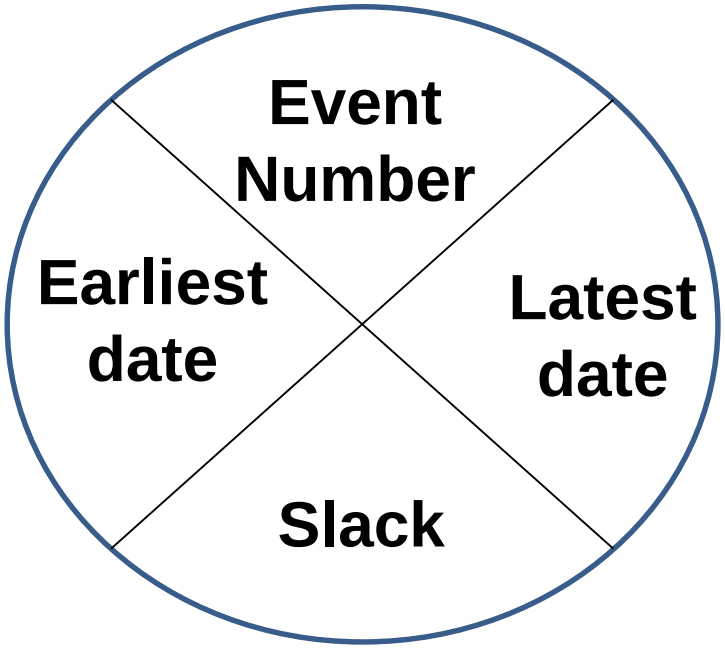
Activity-on-Arrow Network



Activity-on-Arrow Network Rules

- Only one start node
- Only one end node
- A link has duration
- Nodes have no duration
- Time moves from left to right
- Nodes are numbered sequentially
- A network may not contain loops
- A network may not contain dangles.

Conventions



Problem-1

Find critical path using activity-on-arrow network.

Activity	Duration(Weeks)	Precedents
A:Hardware Selection	6	
B:System Configuration	4	
C:Instal Hardware	3	A
D:Data migration	4	B
E:Draft office Procedures	3	B
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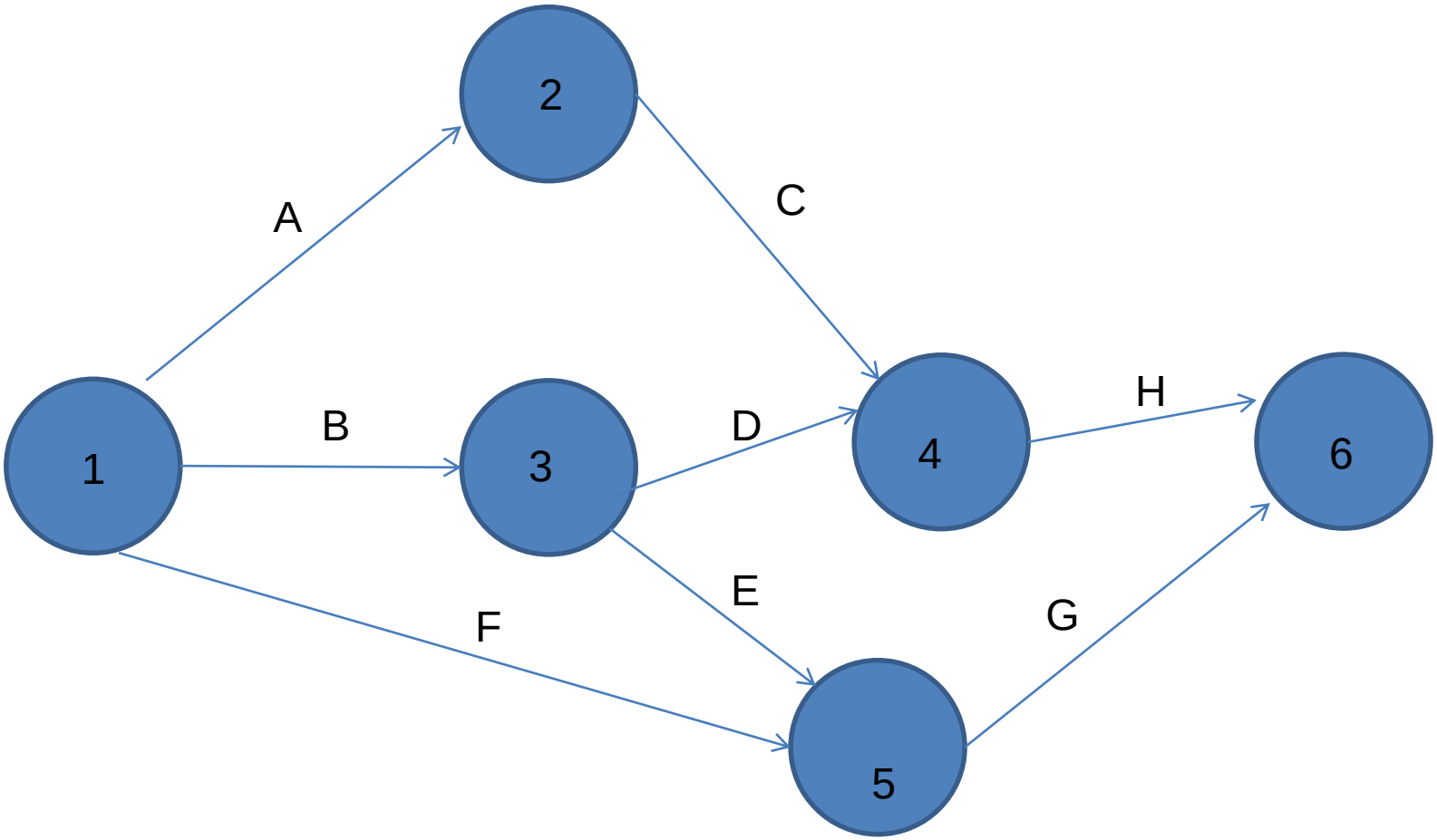
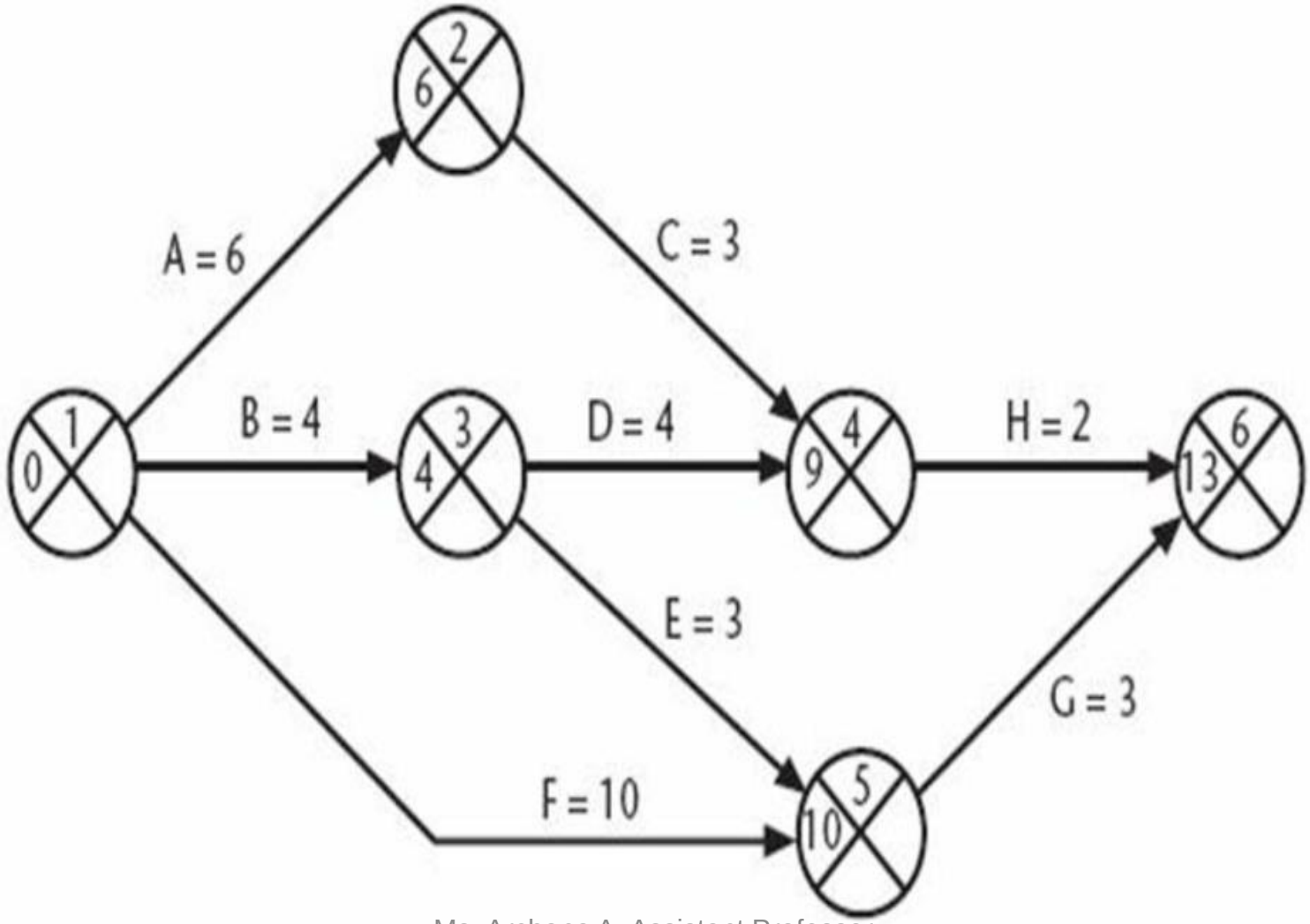
Activity-on-Arrow Network



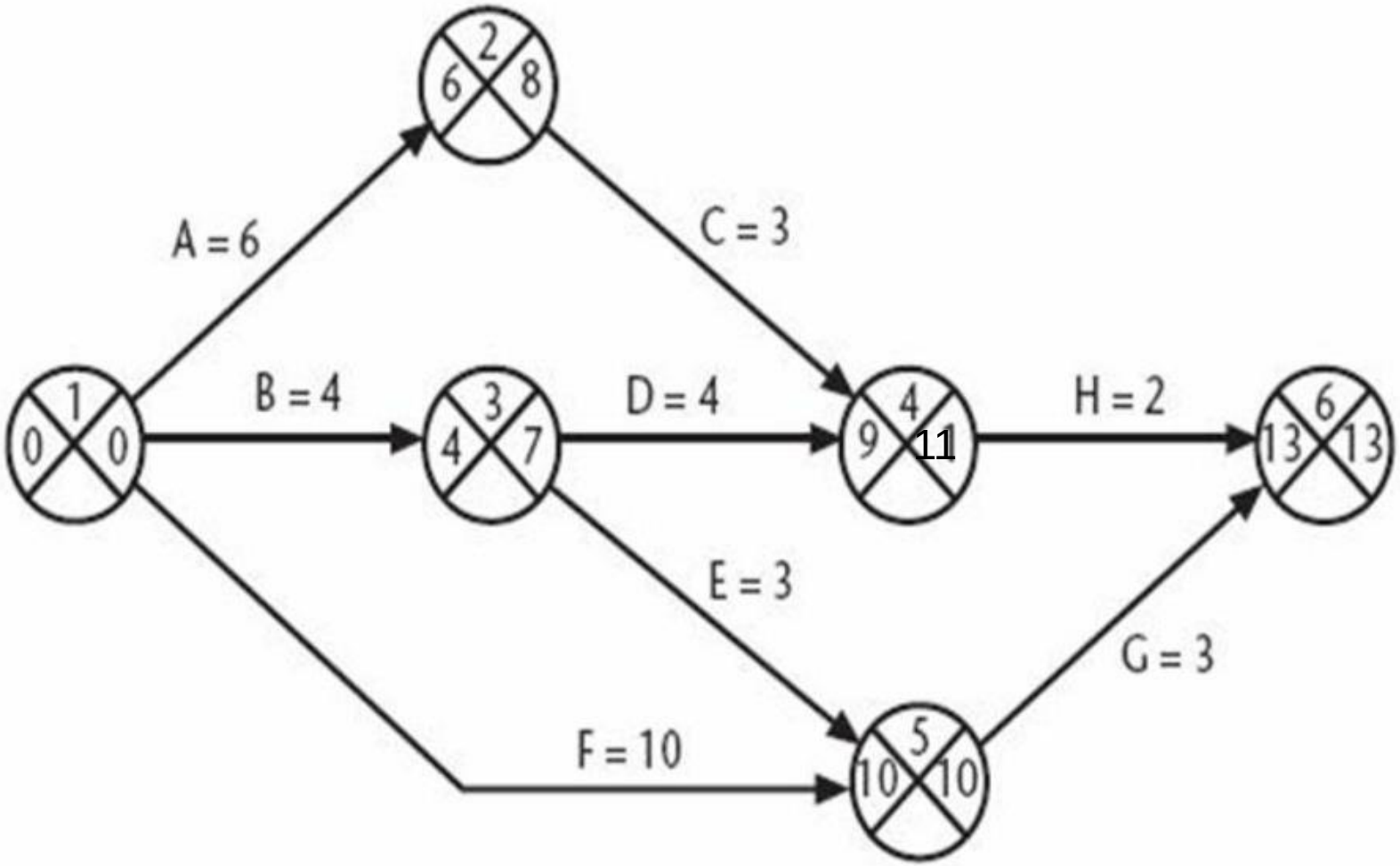
CPM network after forward pass



Activity table after forward pass

Activity	Duration	Earliest start date	Latest start date	Earliest finish date	Latest finish date	Total float
A	6	0		6		
B	4	0		4		
C	3	6		9		
D	4	4		8		
E	3	4		7		
F	10	0		10		
G	3	10		13		
H	2	9		11		

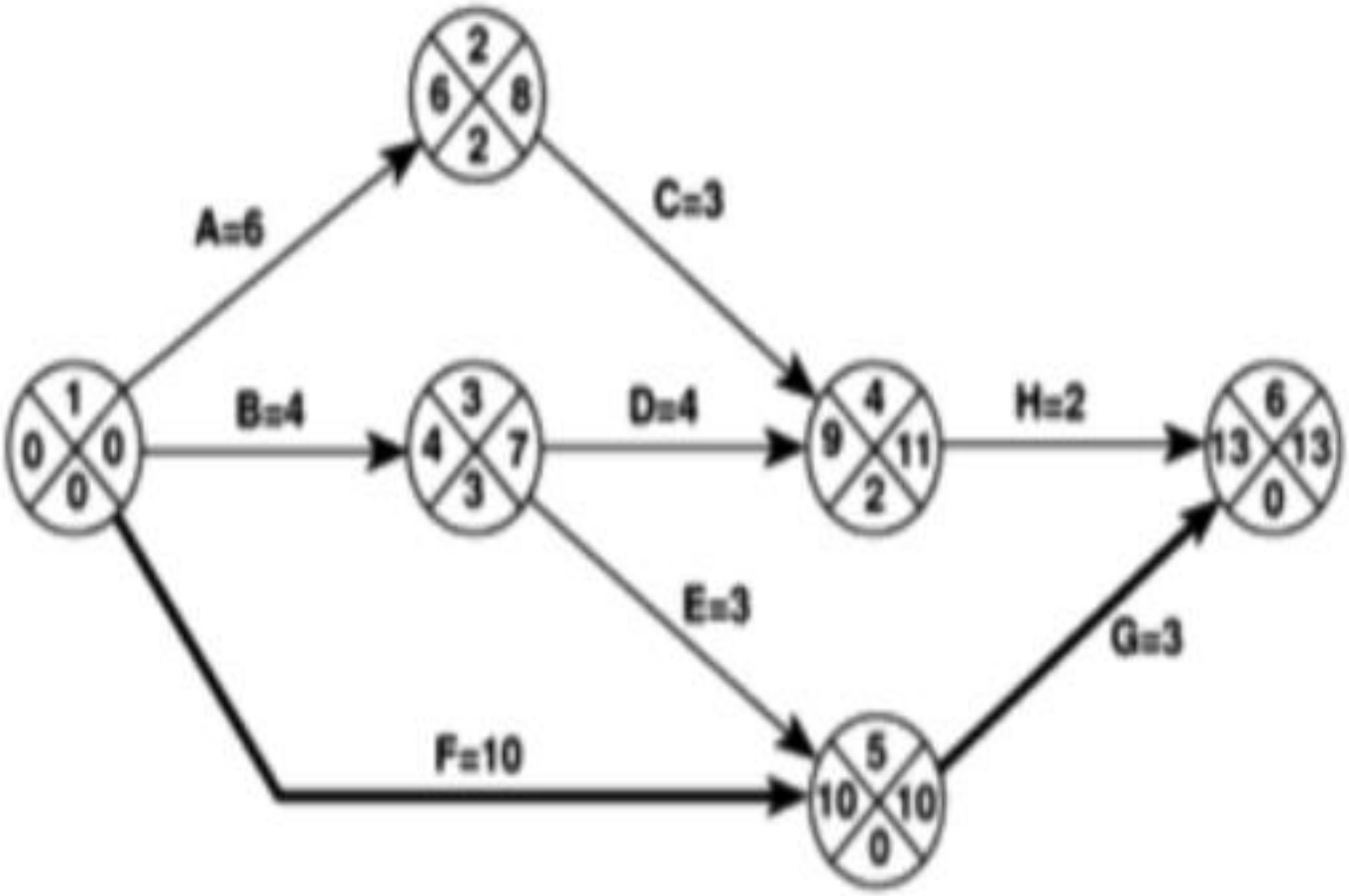
CPM network after backward pass



Activity table after backward pass

Activity	Duration	Earliest start date	Latest start date	Earliest finish date	Latest finish date	Total float
A	6	0	2	6	8	
B	4	0	3	4	7	
C	3	6	8	9	11	
D	4	4	7	8	11	
E	3	4	7	7	10	
F	10	0	0	10	10	
G	3	10	10	13	13	
H	2	9	11	11	13	

Critical path



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