CSE4708: Software Project Management

Unit III : Activity Planning & Risk Management

Topic:

Network Planning Model – Critical Path Method

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Network Planning Model

- Scheduling techniques model the project's activities and their relationships as a "Network".
- In network planning model, time flows from left to right
- These techniques were developed in 1950's
- There are two best techniques:
  - CPM (Critical Path Method)
  - PERT (Program Evaluation Review Technique)
- Both uses an "activity-on-arrow" approach
- Activities are drawn as arrows joining circles, or nodes Which show the start and completion time of the activities

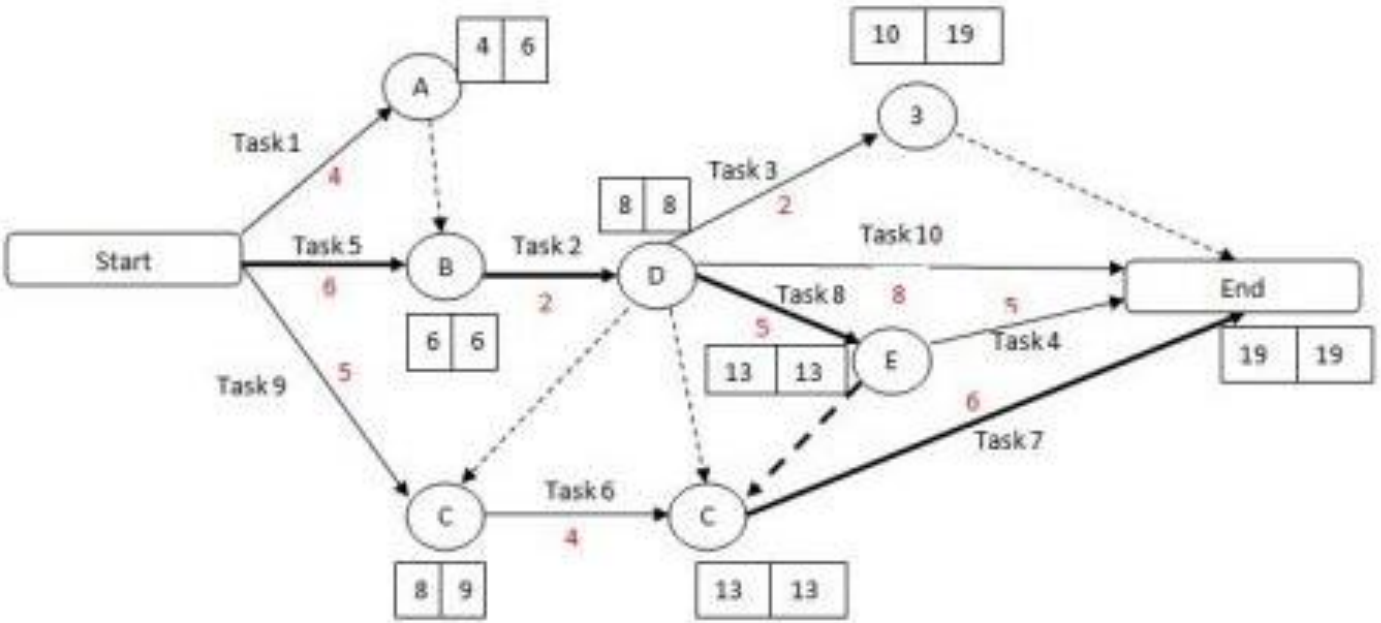
Critical Path Method

- Critical path is the sequential activities from start to the end of a project.
- Although many projects have only one critical path, some projects may have more than one critical paths depending on the flow logic used in the project.
- If there is a delay in any of the activities under the critical path, there will be a delay of the project deliverables.
- Most of the times, if such delay is occurred, project acceleration or re-sequencing is done in order to achieve the deadlines.

Critical Path Method

- Critical path method is based on mathematical calculations and it is used for scheduling project activities. This method was first introduced in 1950s as a joint venture between Remington Rand Corporation and DuPont Corporation.
- The initial critical path method was used for managing plant maintenance projects. Although the original method was developed for construction work, this method can be used for any project where there are interdependent activities.
- In the critical path method, the critical activities of a program or a project are identified. These are the activities that have a direct impact on the completion date of the project.

Critical Path Method



Key Steps in Critical Path Method

- Step 1: Activity specification
- Step 2: Activity sequence establishment
- Step 3: Network diagram
- Step 4: Estimates for each activity
- Step 5: Identification of the critical path
- Step 6: Critical path diagram to show project progresses

Critical Path Method

Advantages of Critical Path Method

- Offers a visual representation of the project activities.
- Presents the time to complete the tasks and the overall project.
- Tracking of critical activities.

Critical Path Method

Adding Time Dimension

- Each activity have an estimate of its duration.
- Forward pass – Earliest dates at which activities may commence and project be completed.
- Backward pass – Latest start dates for activities and critical path.

Critical Path Method – Project Specification, an example

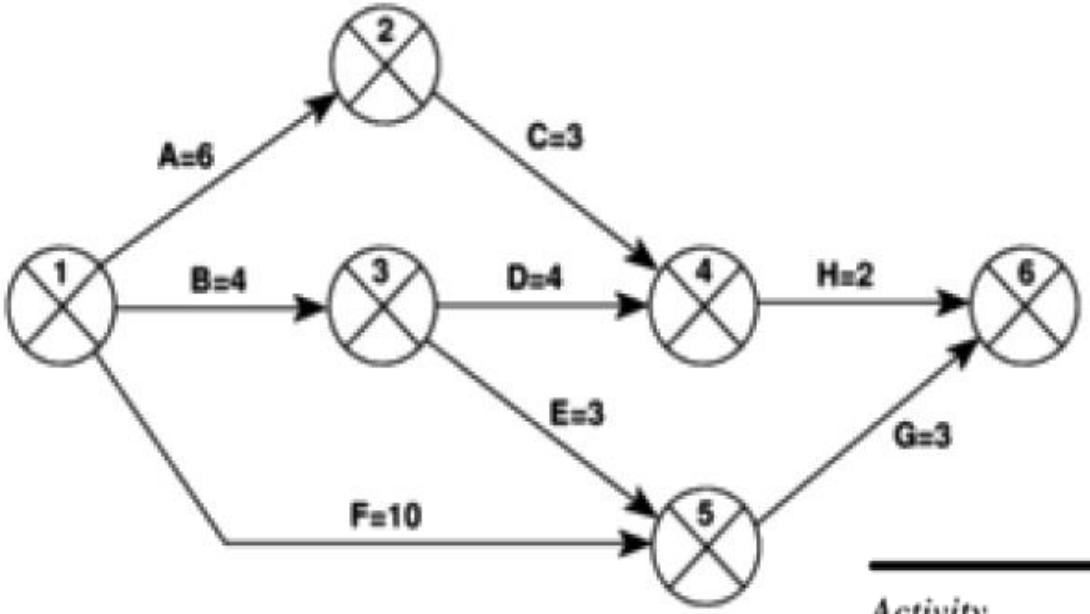
Activity		*Duration (weeks)*	*Precedents*
A	Hardware selection	6	
B	Software design	4	
C	Install hardware	3	A
D	Code & test software	4	B
E	File take-on	3	B
F	Write user manuals	10	
G	User training	3	E, F
H	Install & test system	2	C, D

Critical Path Method

- Forward Pass

Activity	Duration (Weeks)	Earliest Start Date (Weeks)	Earliest Finish Date(Weeks)
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

Critical Path Method



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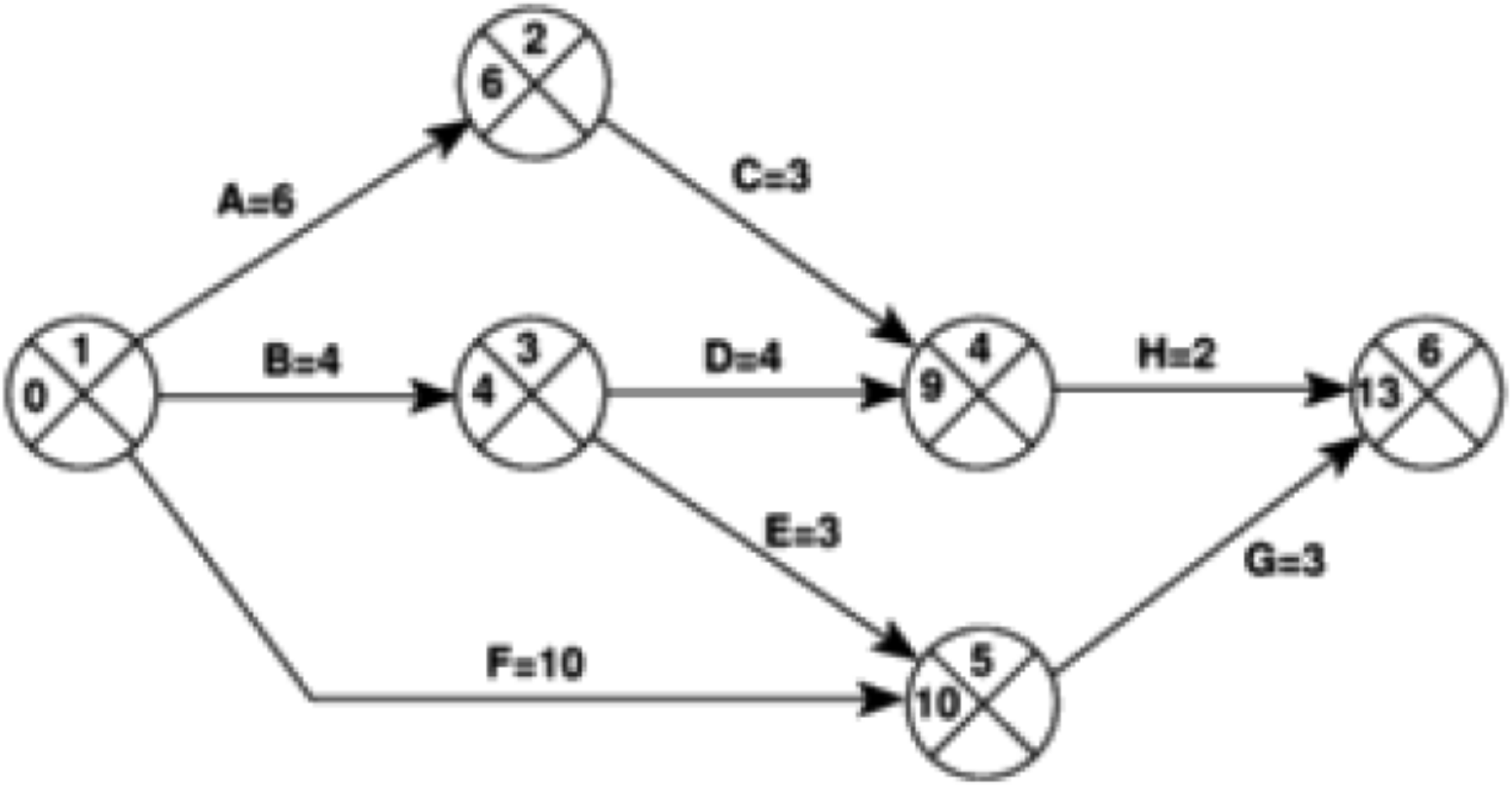
Critical Path Method



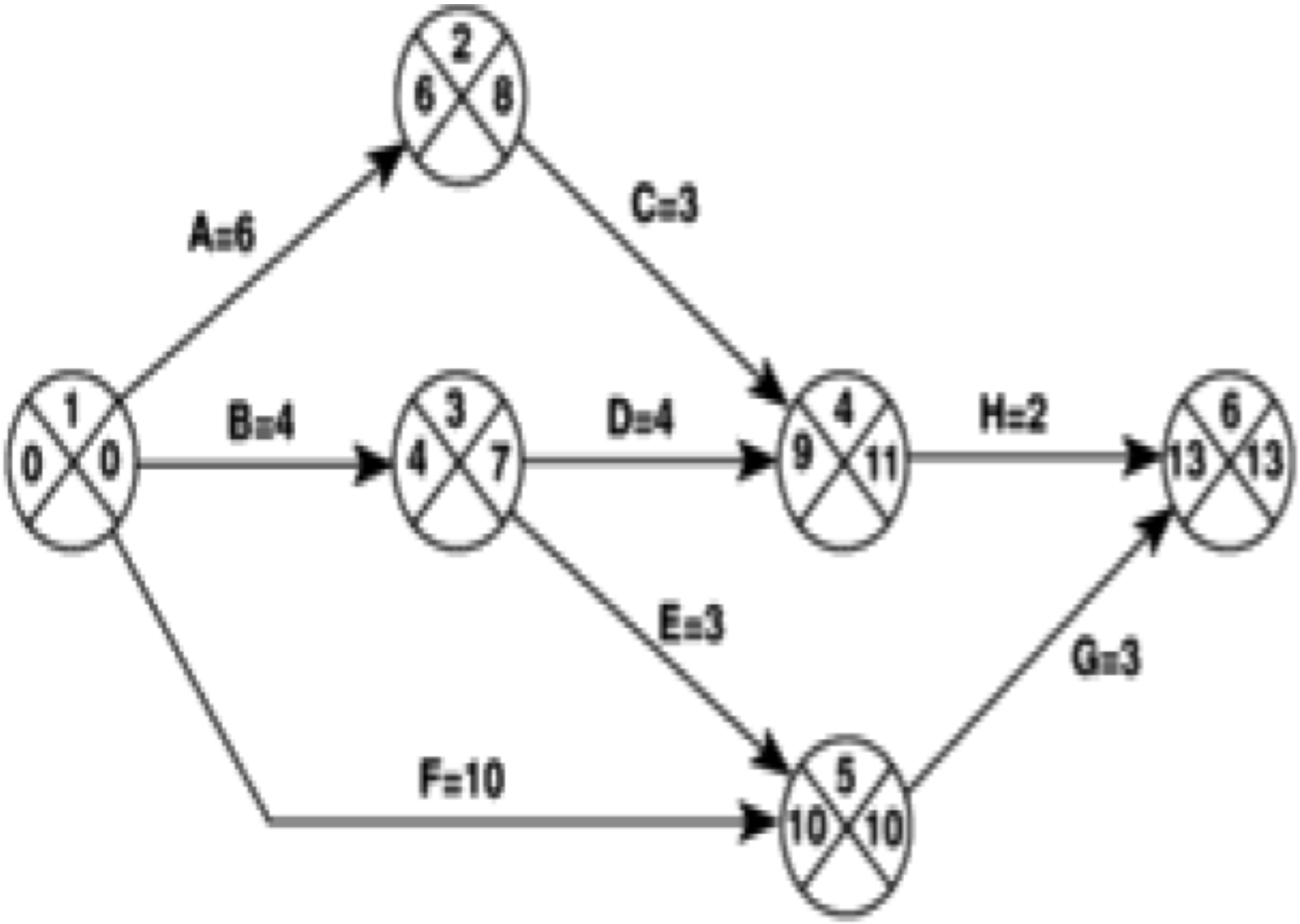
Critical Path Method

Activity	Duration (weeks)	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		

Critical Path Method

Activity	*Duration (weeks)*	*Earliest start date*	*Latest start date*	*Earliest finish fate*	*Latest finish date*
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 Method

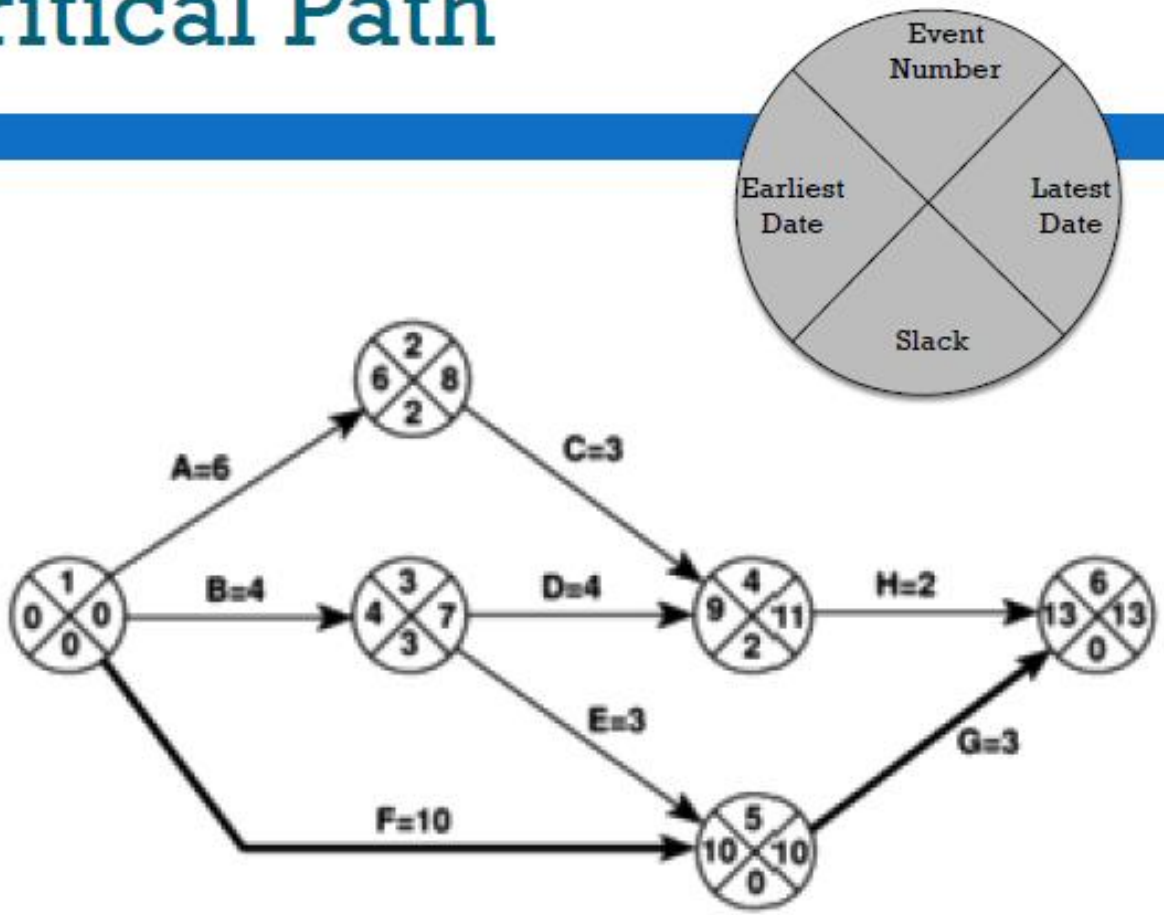


Critical Path Method

- Any delay on the critical path will delay the project.
- Difference between earliest and latest date for an event is known as slack.
- Event with slack of zero is critical as any delay in achieving that event will delay the completion date of the project.

Critical Path Method

Critical Path



Critical Path Method

- As events have slack, activities possess float.
- Total float is the difference between earliest start and latest start (or difference between earliest finish and latest finish)

Critical Path Method

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

Critical Path Method

Activity	Immediate Predecessor	Time
A		3
B		8
C		5
D	A	9
E	C	2
F	B,E	6
H	B,E	12
G	D	11

- Find out the critical path and total float.

Practise Question

Actvity	Name	Time	Actvity	Name	Time
1-2	A	4	5-6	G	4
1-3	B	1	5-7	H	8
2-4	C	1	6-8	I	1
3-4	D	1	7-8	J	2
3-5	E	6	8-10	K	5
4-9	F	5	9-10	L	7

Draw activity network of the project. Find out the critical Path.

- Find total float of each activity.

Critical Path Method

Activity	Time in Weeks
1-2	20
1-3	25
2-3	10
2-4	12
3-4	5
3-5	10

- Draw activity network of the project.
- Find total float of each activity.

Recommended Reading

- Pressman, Roger S., “Software Engineering – A practitioner’s Approach”, “Chapter -7: Project Scheduling and Tracking”, 5th edition.
- https://www.tutorialspoint.com/management_concepts/critical_path_method.htm