SOFTWARE PROJECT MANAGEMENT

Module-3: ACTIVITY PLANNING AND RISK MANAGEMENT Part-2

CSE4016

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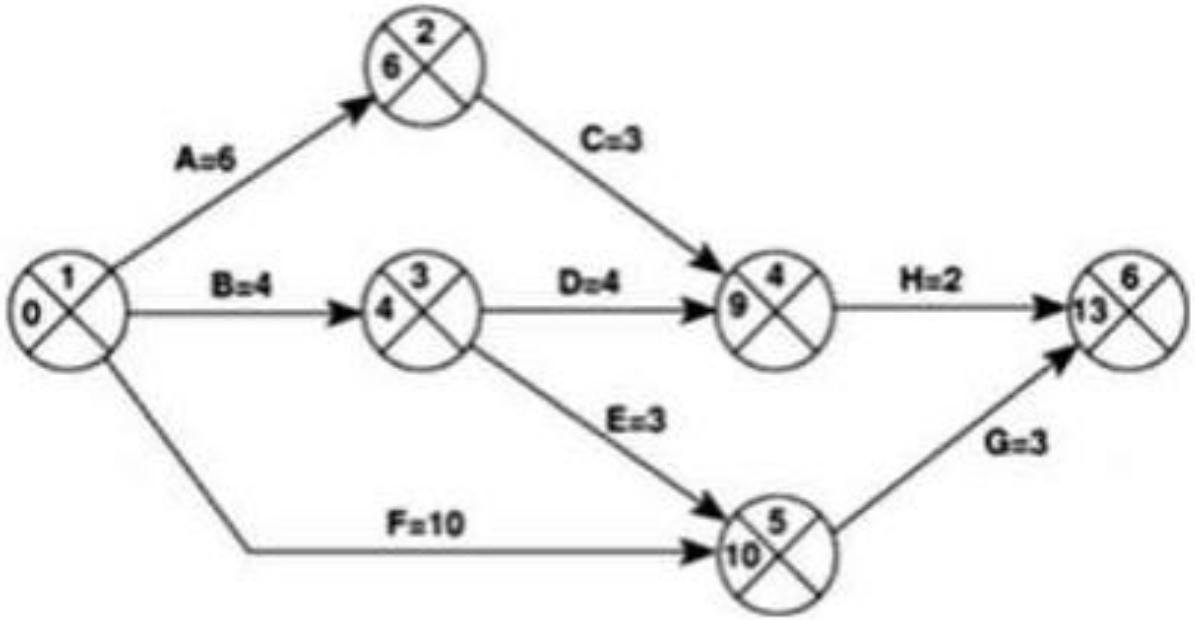
Forward pass

- During the forward pass, earliest dates are recorded as they are calculated. For events, they are recorded on the network diagram and for activities they are recorded on the activity table.
- The forward pass is carried out to calculate the earliest date on which each event may be achieved and the earliest date on which each activity may be started and completed.
- The earliest date for an event is the earliest date by which all activities upon which it depends can be completed.
- By convention, dates indicate the end of the a period and the project is therefore shown as starting in week zero (or the beginning of week I).

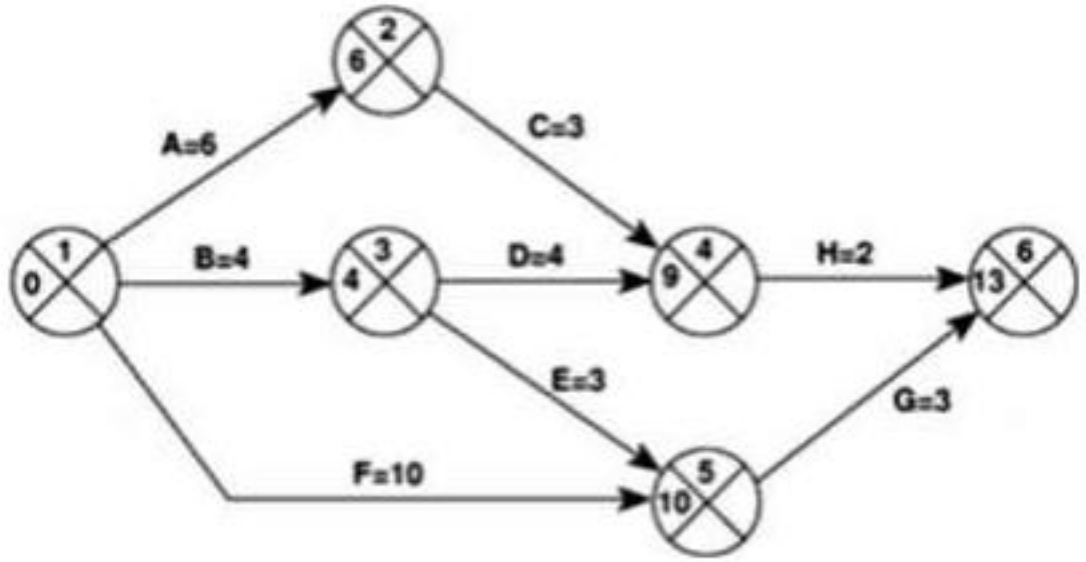
	Activity	Duration (weeks)	Precedents
A	Hardware selection	6	
B	System configuration	4	
C	Install hardware	3	A
D	Data migration	4	B
E	Draft office procedures	3	B
F	Recruit staff	10	
G	User training	3	E, F
H	Install and test system	2	C, D

A CPM network after the forwardpass



The forward pass and the calculation of earliest start dates is calculated according to the following reasoning.

- Activities A. B and F may start immediately, so the earliest date for event 1 is zero and the earliest start date for these three activities is also zero.
- Activity A will take 6 weeks, so the earliest it can finish is week 6 (recorded in the activity table). Therefore the earliest we can achieve event 2 is week 6.



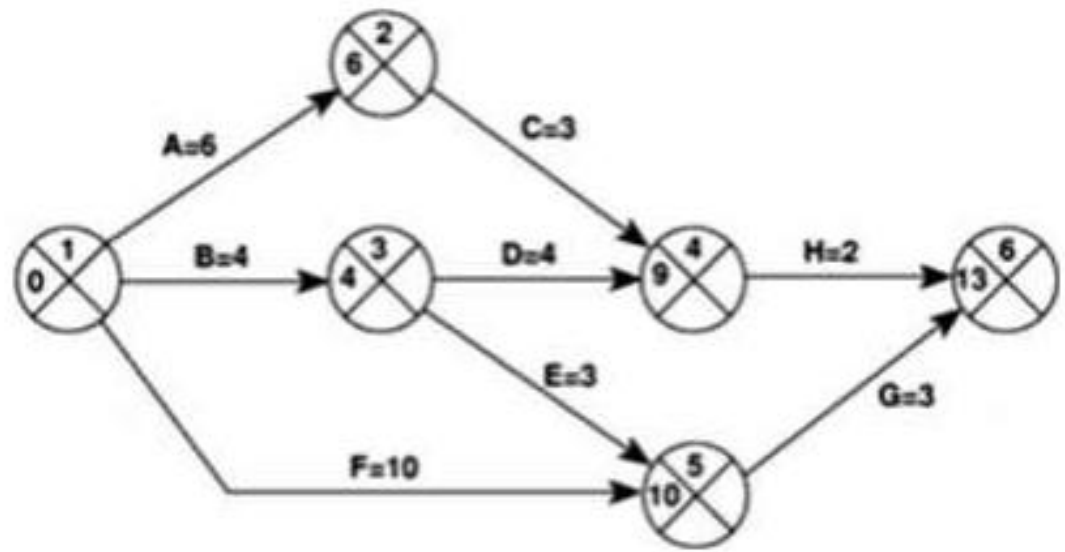
- Activity B w ill take 4 weeks, so the earliest it can finish and the earliest we can achieve event 3 is week 4.
- Activity F will take 10 weeks, so the earliest it can finish is week 10 - we cannot, however, tell whether or not this is also the earliest date that we can achieve event 5 since we have not, as yet, calculated when activity E will finish.

- Activity K can start as early as week 4 (the earliest date for event 3) and, since it is forecasted to take 3 weeks, w ill be completed, at the earliest, at the end of week 7.
- Event 5 may be achieved when both E and F have been completed, that is. week 10 (the later of 7 and 10).
- Similarly we can reason that event 4 will have an earliest date of week 9. This is the later of the earliest finish for activity D (week 8) and the earliest finish for activity C (week 9).
- The earliest date for the completion of the project, event 6, is therefore the end of week 13 - the later of 11 (the earliest finish for H) and 13 (the earliest finish for G).

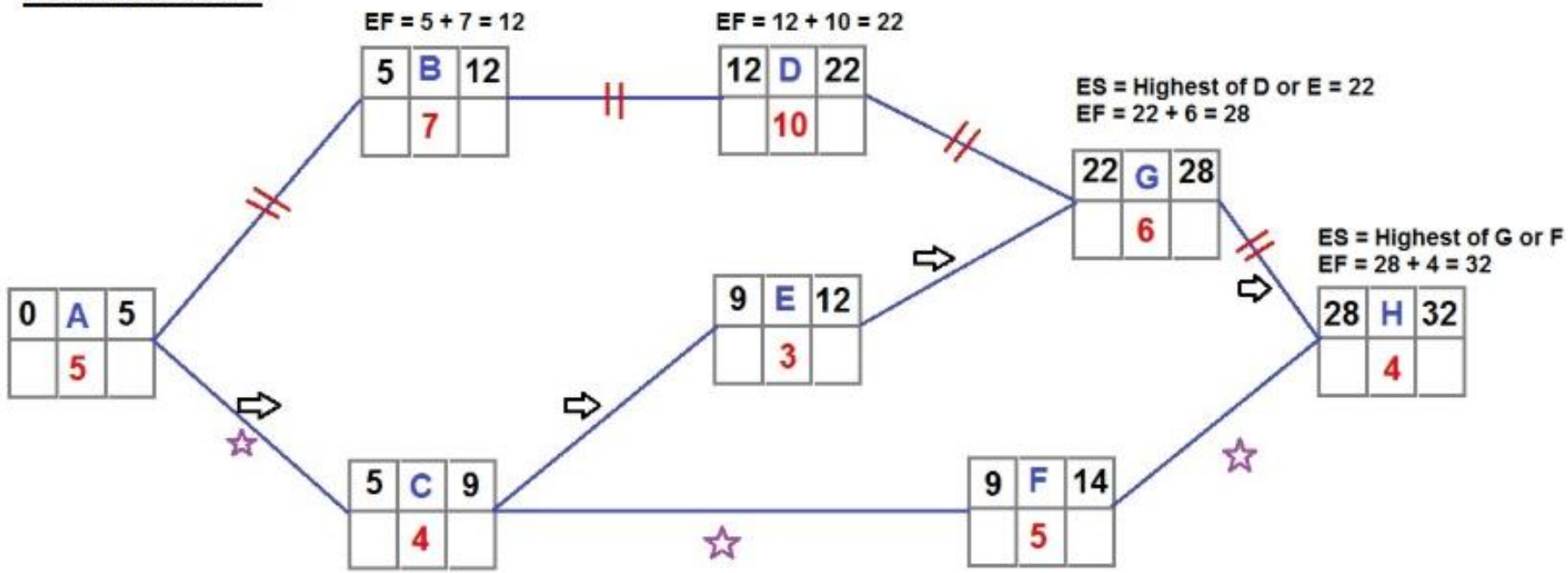
- ***The forward pass rule:*** the earliest date for an event is the earliest finish date for all the activities terminating at that event. Where more than one activity terminates at a common event we take the latest of the earliest finish dates for those activities.

Table 6.2 *The activity table after the forward pass*

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		



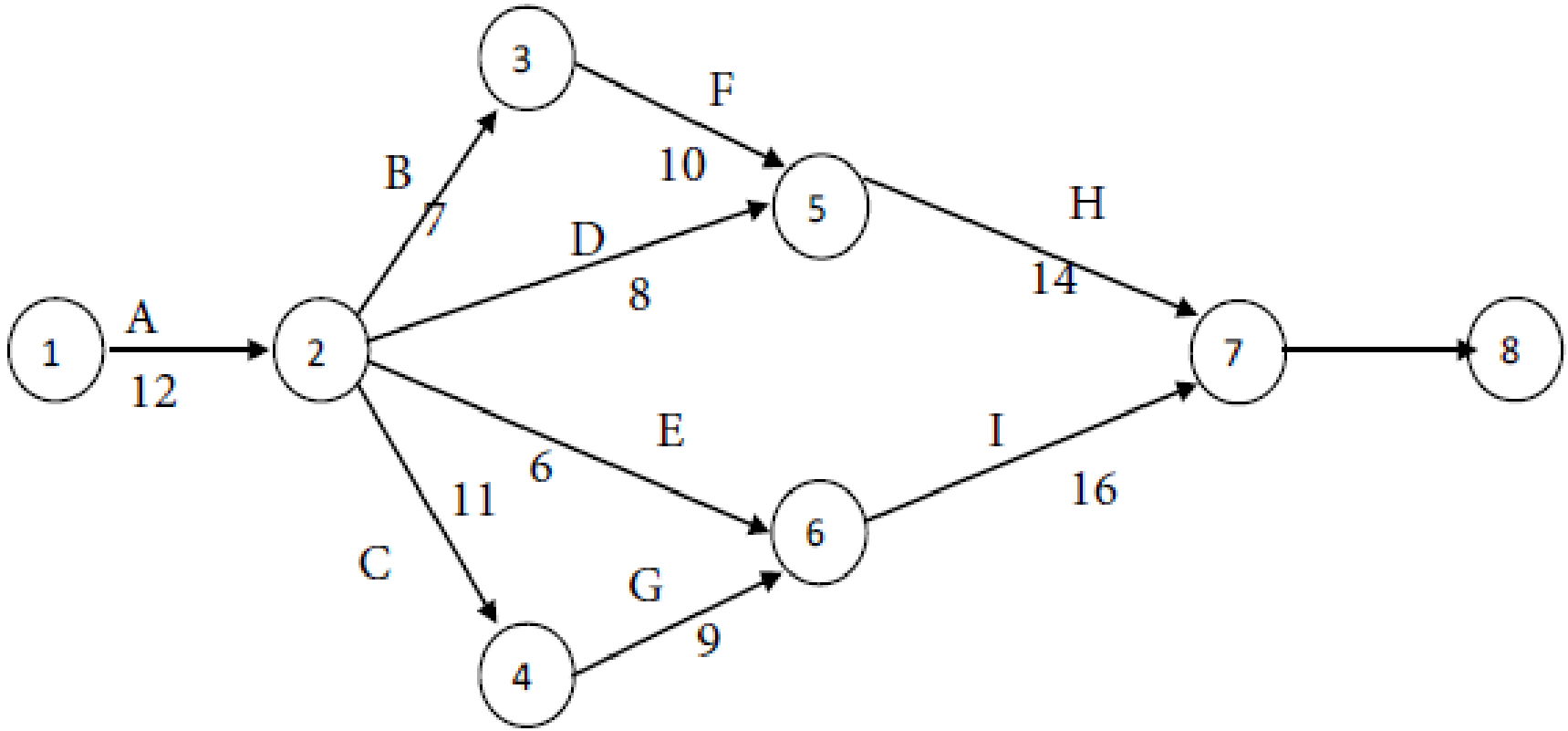
FORWARD PASS



Practice question-1

Activity	Predecessor Activity	Duration (Weeks)
A	-	12
B	A	7
C	A	11
D	A	8
E	A	6
F	B	10
G	C	9
H	D, F	14
I	E, G	13
J	H, I	16

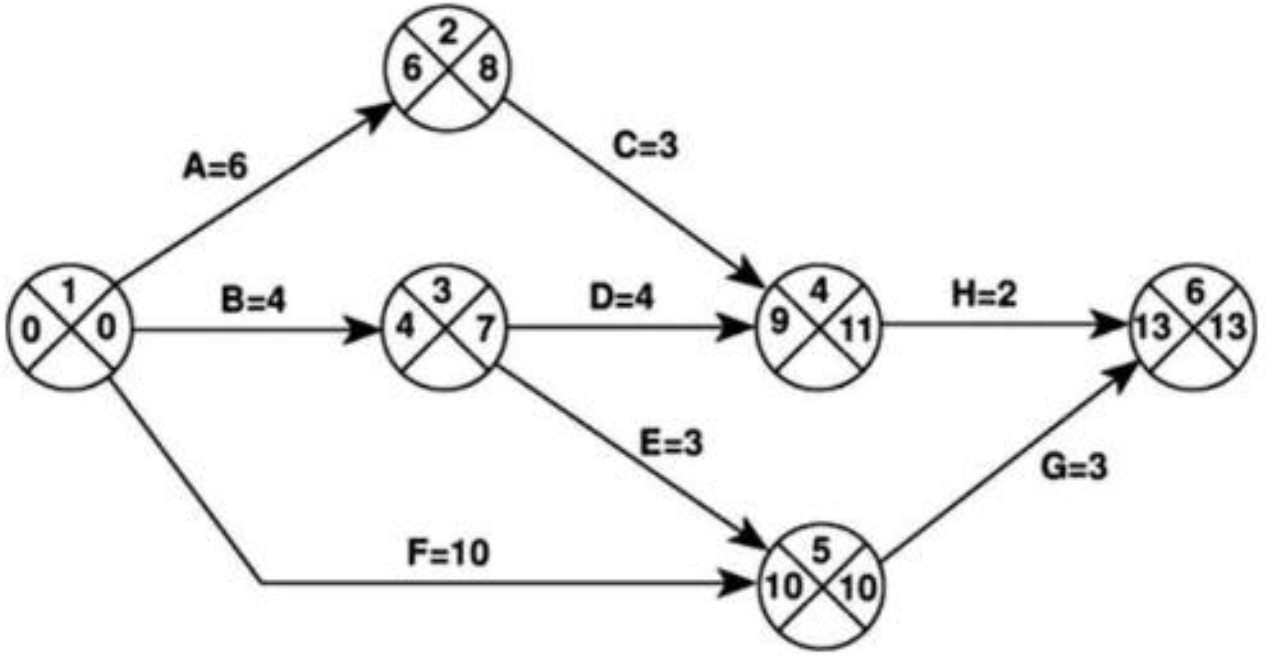
Activity diagram-1

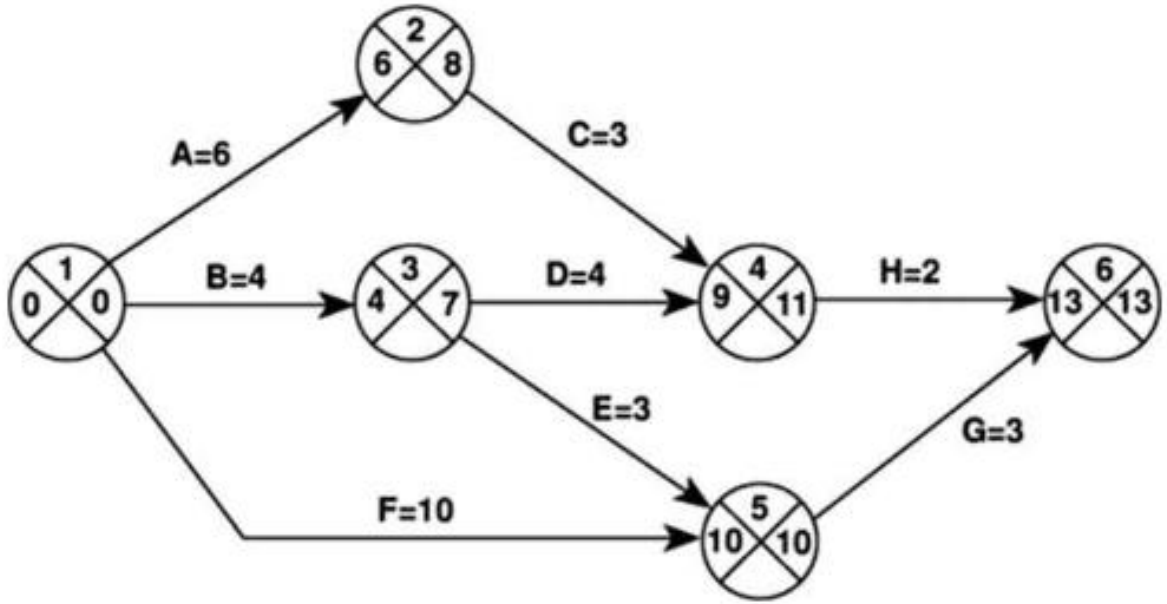


Backward pass

- The second stage is to carry out a backward pass to calculate the latest date at which each event may be achieved, and each activity started and finished, without delaying the end date of the project.
- The latest date for an event is the latest date by which all immediately following activities must be started for the project to be completed on time.
- In calculating the latest dates, we assume that the latest finish date for the project is the same as the earliest finish date - that is, we wish to complete the project as early as possible.

The backward pass rule: the latest date for an event is the latest start date for all the activities that may commence from that event. Where more than one activity commences at a common event we take the earliest of the latest start dates for those activities.





The activity table following the backward pass

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

The latest event dates are calculated as follows.

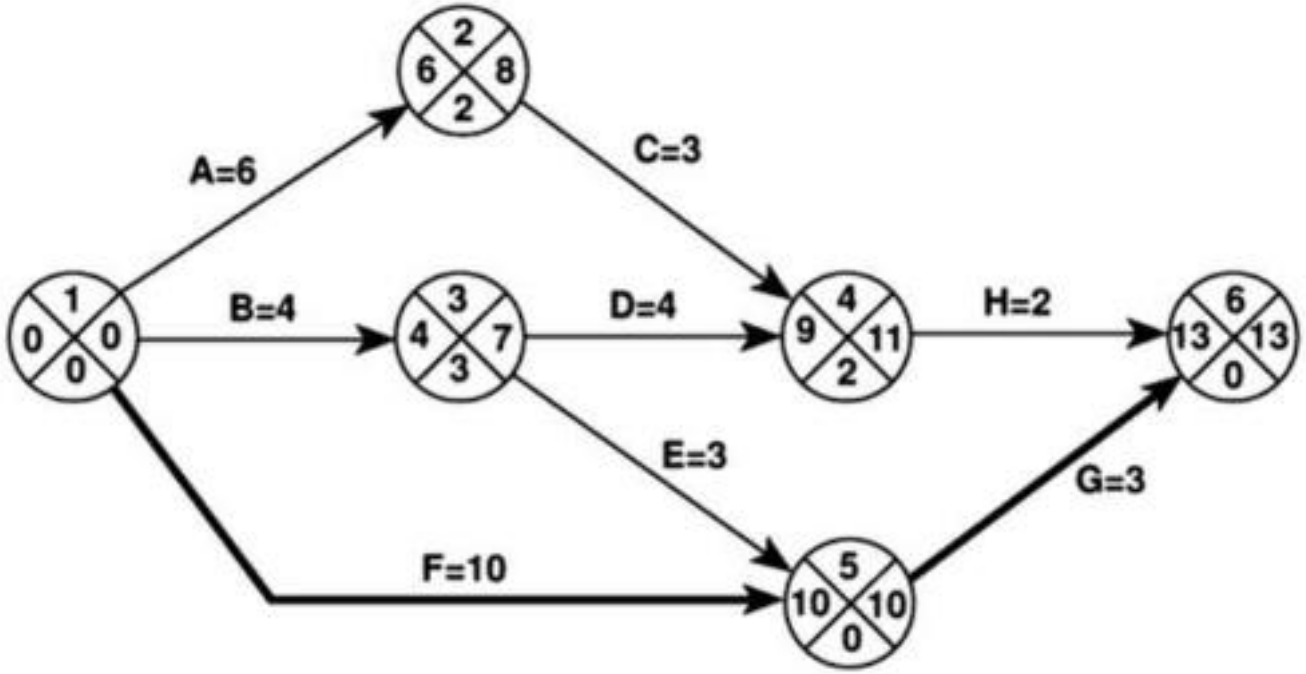
- The latest date for node 6 is assumed to be week 13, the same as the earliest date.
- The latest date for event 5 is week 10, since activity G will take 3 weeks and must be completed by week 13 if the project end date is not to be exceeded.
- The latest date for event 4 is week 11 since activity H does not need to be started until week 11 if it takes 2 weeks and does not need to be completed until week 13.
- The latest date for event 3 is the latest date by which we must be in a position to start both activities D and E. Activity E need not finish until week 10 and need not therefore start until week 7. Activity D need not finish until week 11 and, having a duration of 4 weeks, need not start until week 7. The latest date for event 3 is therefore week 7.
- The latest date for event 2 is week 8 since C, which takes 3 weeks, need not be finished until week 11.
- The earliest and latest dates for the start event must always be the same unless an arithmetic error has occurred.
- The latest date for event 1 is the latest by which we must be in a position to start activity A (which must start by week 2), activity B (which must start by week 3) and activity F (which must start by week 0). This event's latest date is therefore zero. This is, of course, not very surprising since it tells us that if the project does not start on time it won't finish on time.

Identifying the critical path

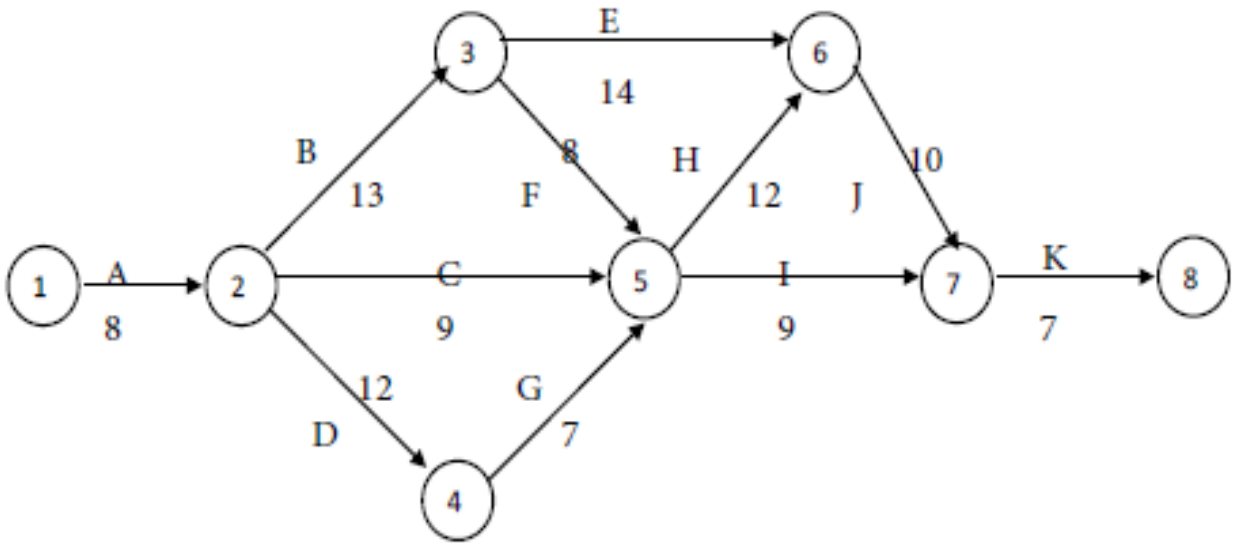
- Any delay on the critical path will delay the project.

- The difference between the earliest date and the latest date for an event is known as the **slack** - it is a measure of how late an event may be without affecting the end date of the project.
- Any event with a slack of zero is critical in the sense that any delay in achieving that event will delay the completion date of the project as a whole.
- There will always be at least one path through the network joining those critical events - this path is known as the **critical path**.

The critical path is the longest path through the network.



Practice question



Determine the earliest and latest times, the total float for each activity, the critical activities, the slacks of the events and the project completion time

Name of Activity	Predecessor Activity	Duration (Weeks)
A	-	8
B	A	13
C	A	9
D	A	12
E	B	14
F	B	8
G	D	7
H	C, F, G	12
I	C, F, G	9
J	E, H	10
K	I, J	7

The significance of the critical path is two-fold.

- 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***.

- In planning the project, it is the critical path that we must shorten if we are to reduce the overall duration of the project.