

Course: UMA 035 (Optimization Techniques)

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Project Management

Construction of a network



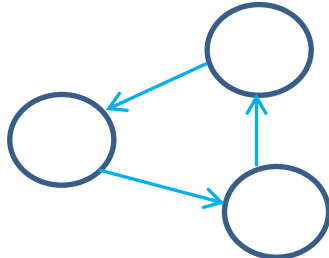
represents a node (place where an activity will start/end)



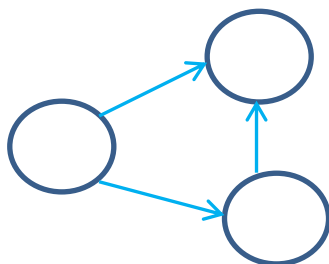
represents an activity between two nodes

Some basic rules for constructing a network

- Activities should not form a closed loop.

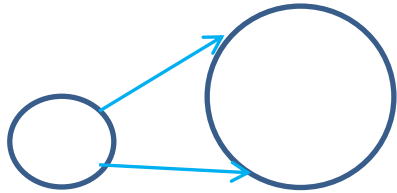


Wrong

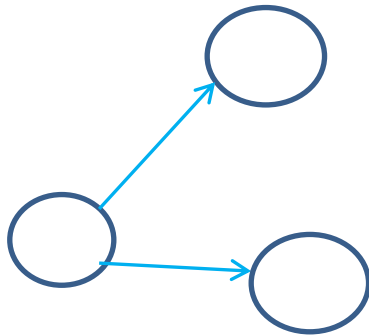


Correct

- Starting and ending nodes of two activities should not be same (If two activities are starting at same node then there ending nodes should be different).

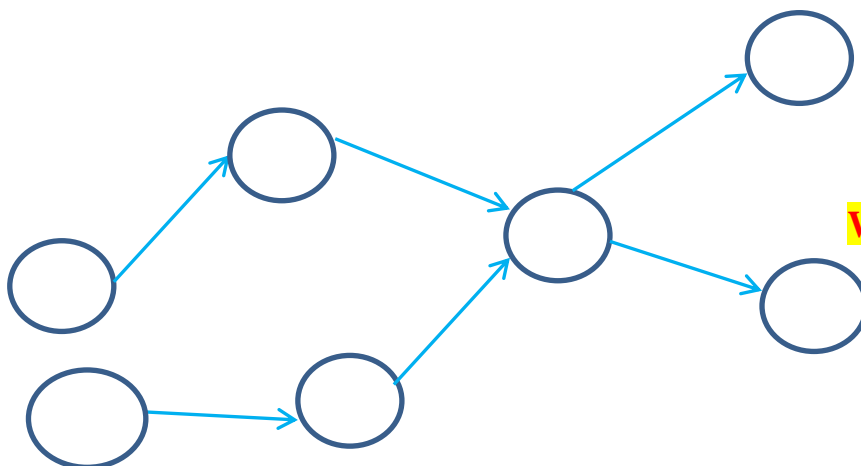


Wrong

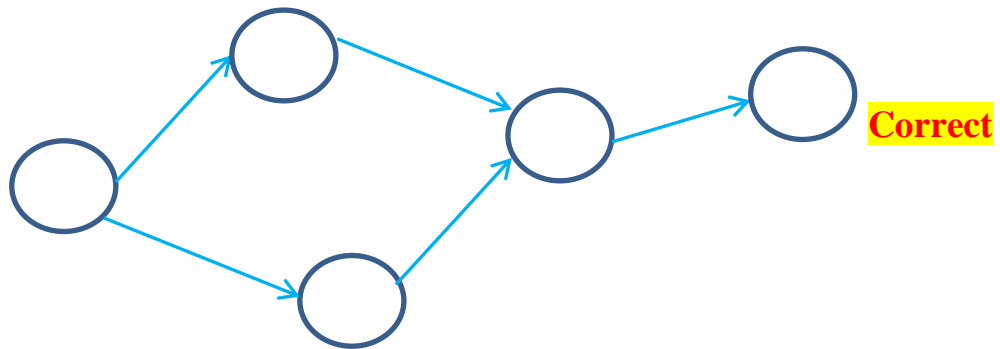


Correct

- The origin and the destination node should be unique (In starting all the activities will start from a unique node and in end all the activities will finish at a unique node).



Wrong



Example:

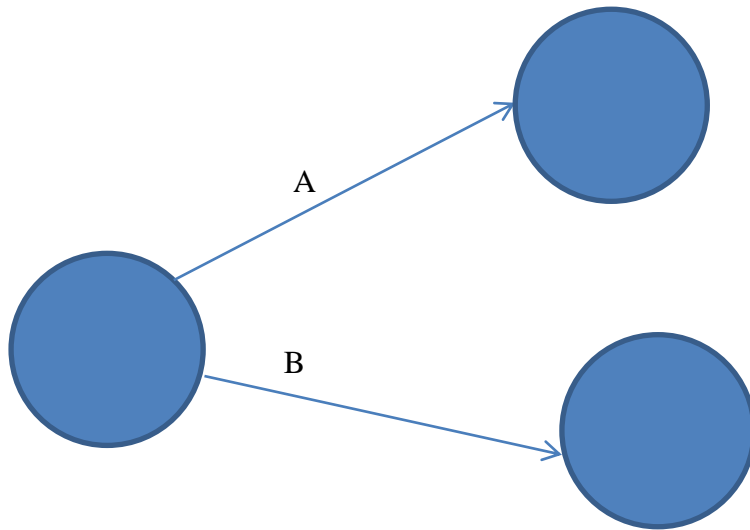
Construct a network by considering the following information:

Activity	A	B	C	D&E	F	G&H	I
Predecessor(s)	-	-	A&B	B	A&B	F&D	C&G

Solution

“-” represents that A and B are the starting activities and hence, should be started from same node.

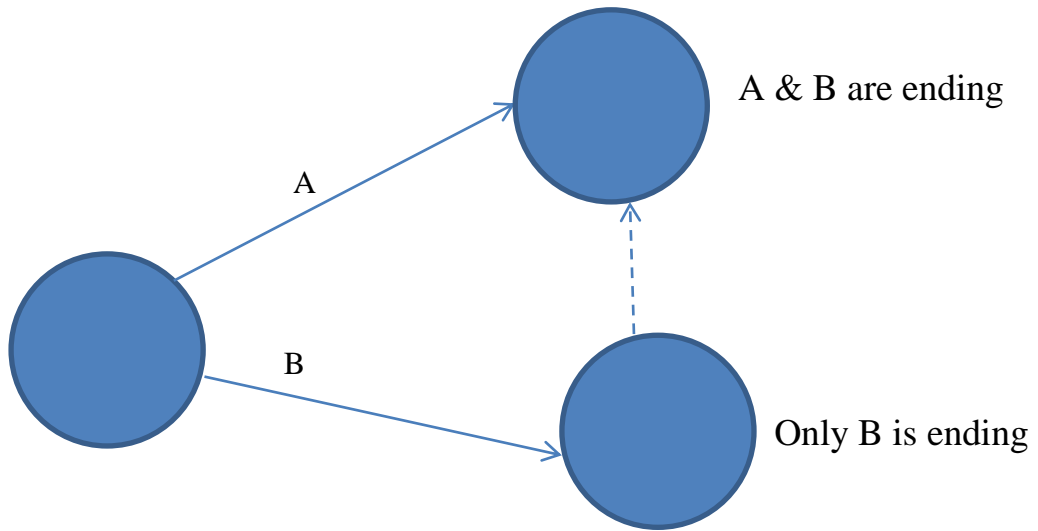
Since, both are starting at same node so there ending nodes should be different.



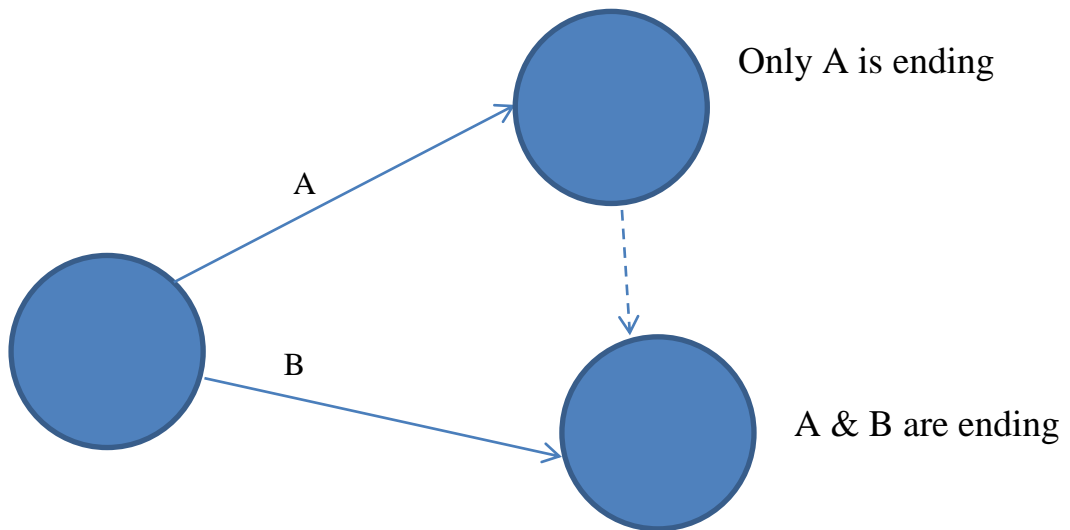
The activity B needs to start from that node at which A& B will finish simultaneously.

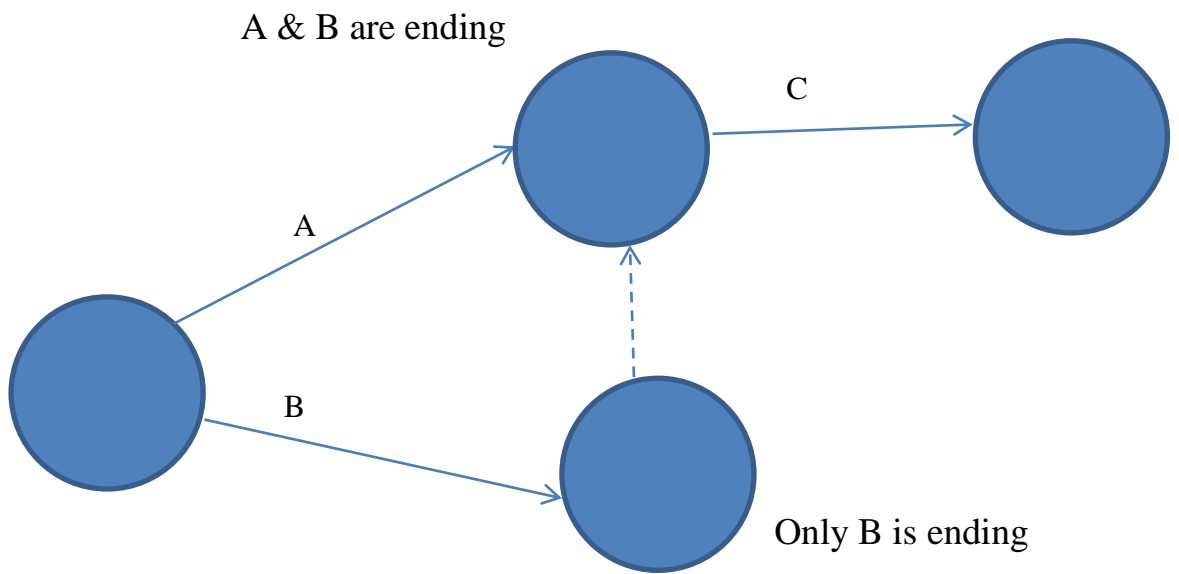
But there is no node at which A& B are ending. We need a dummy activity to finish A&B simultaneously.

The dummy activity may be considered from below to above or above to below as shown below:

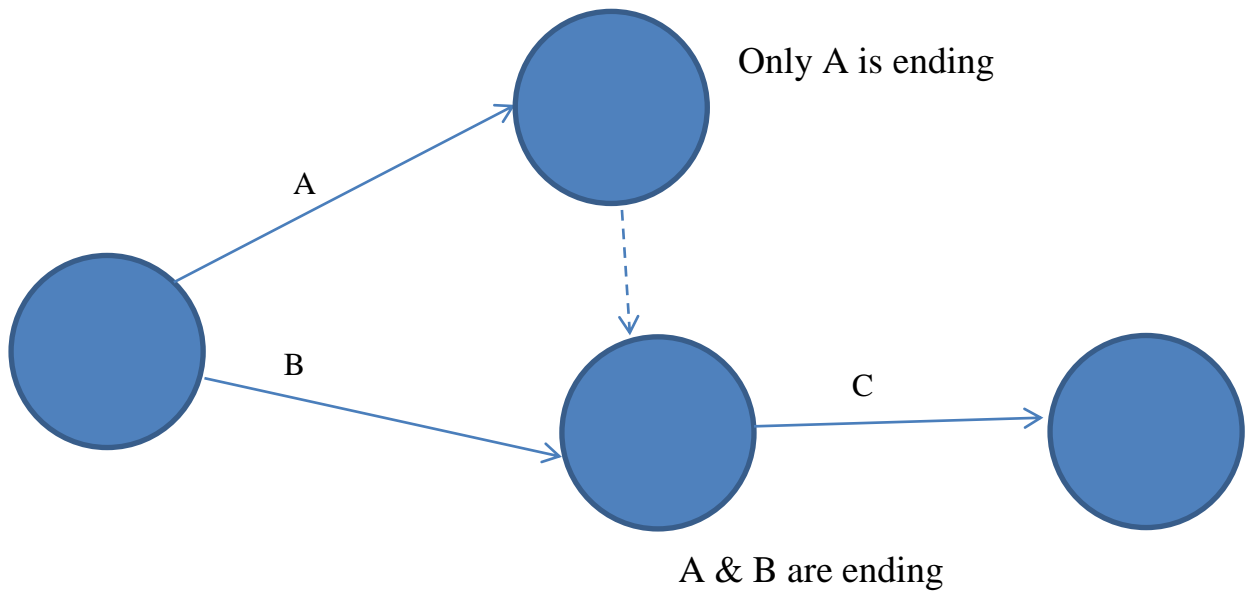


Or



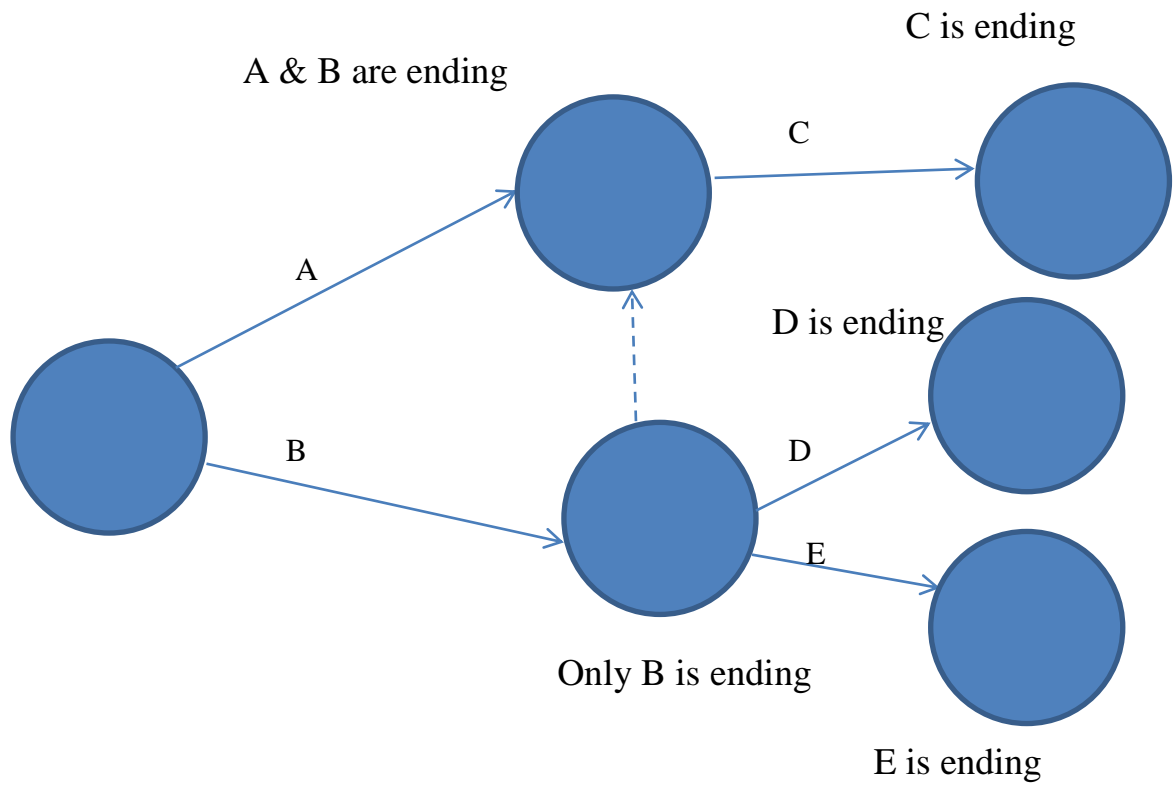


Or

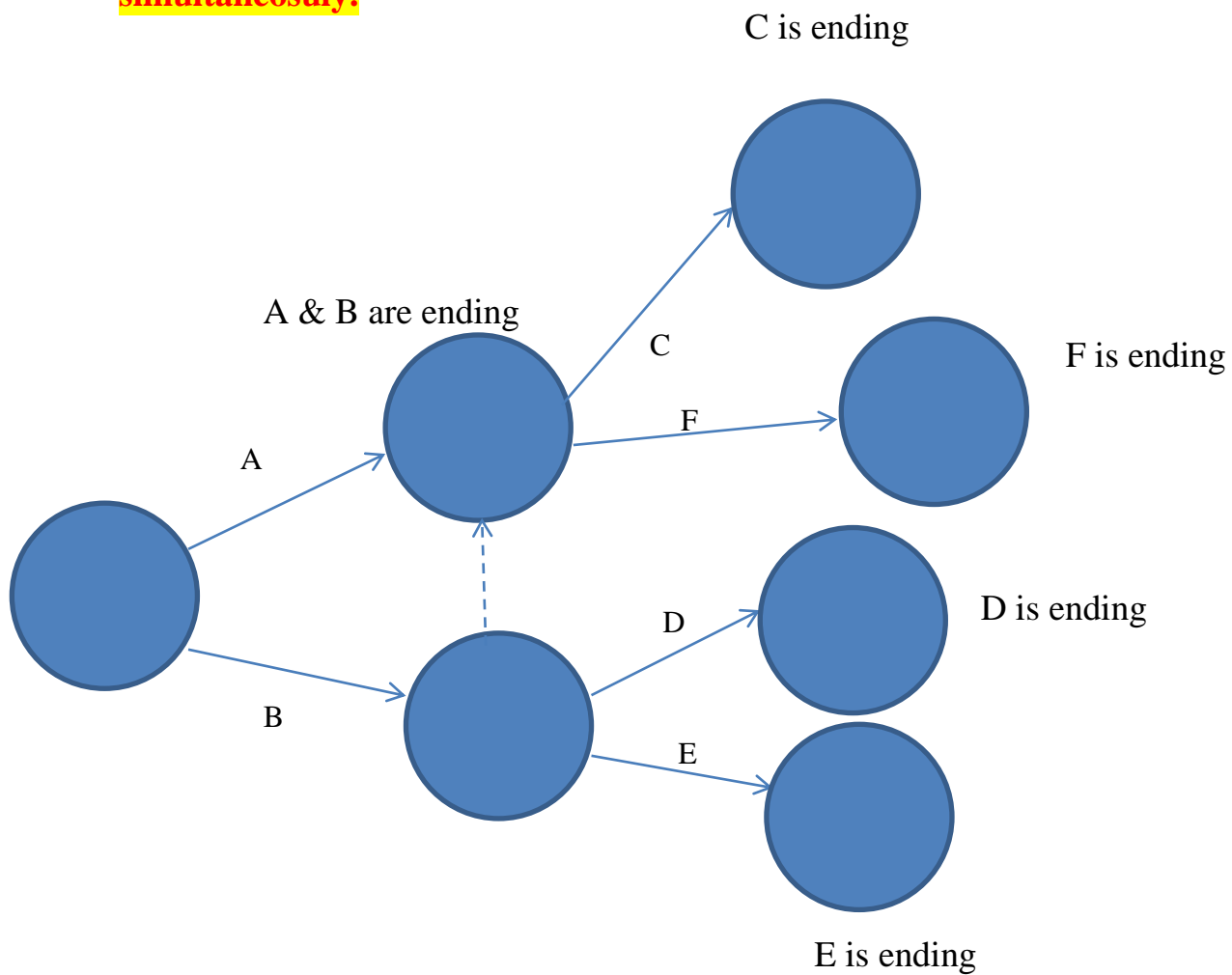


The activity D&E needs to start from that node at which B will finish.

In the second diagram, there is no node at which only B is finishing. So, we cannot proceed with it.

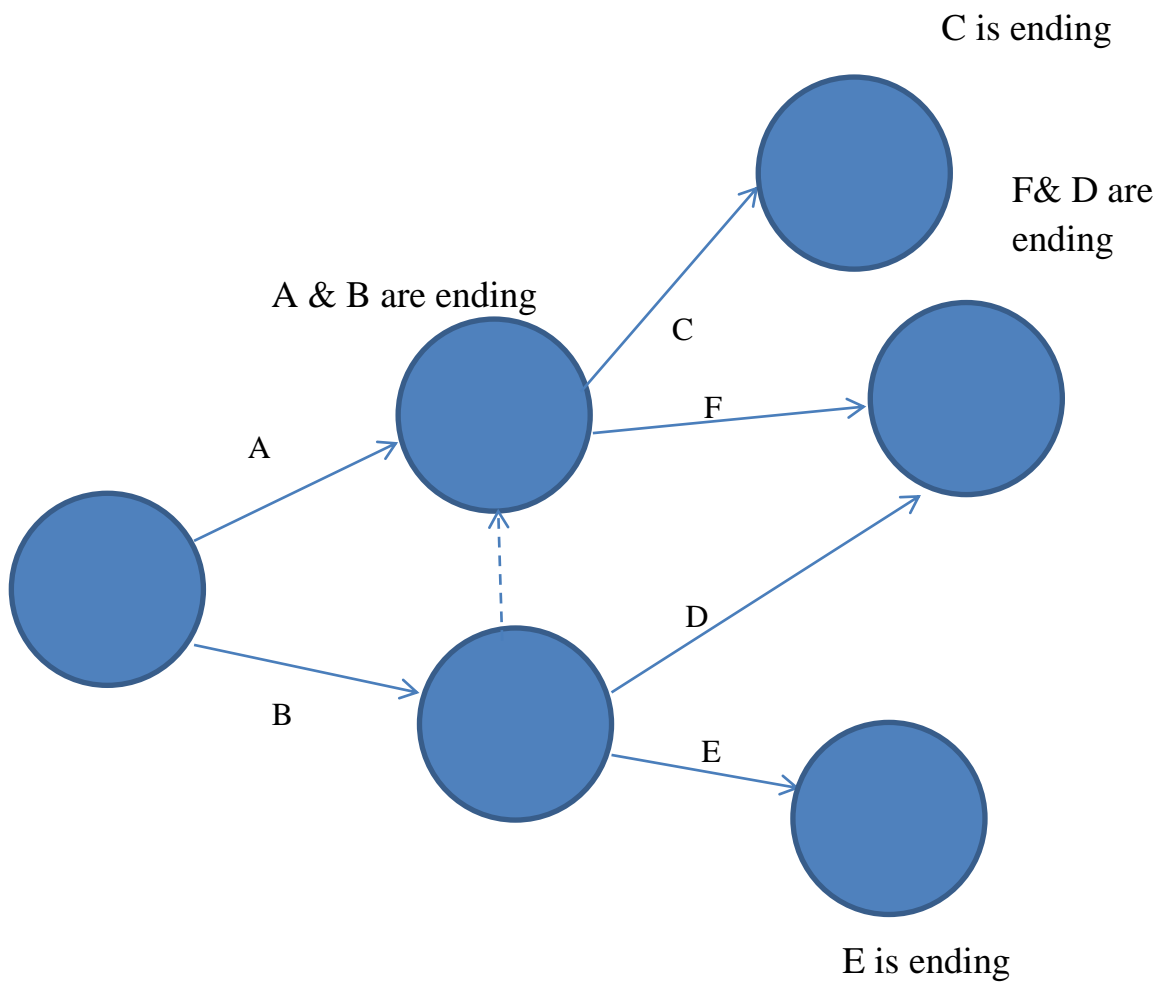


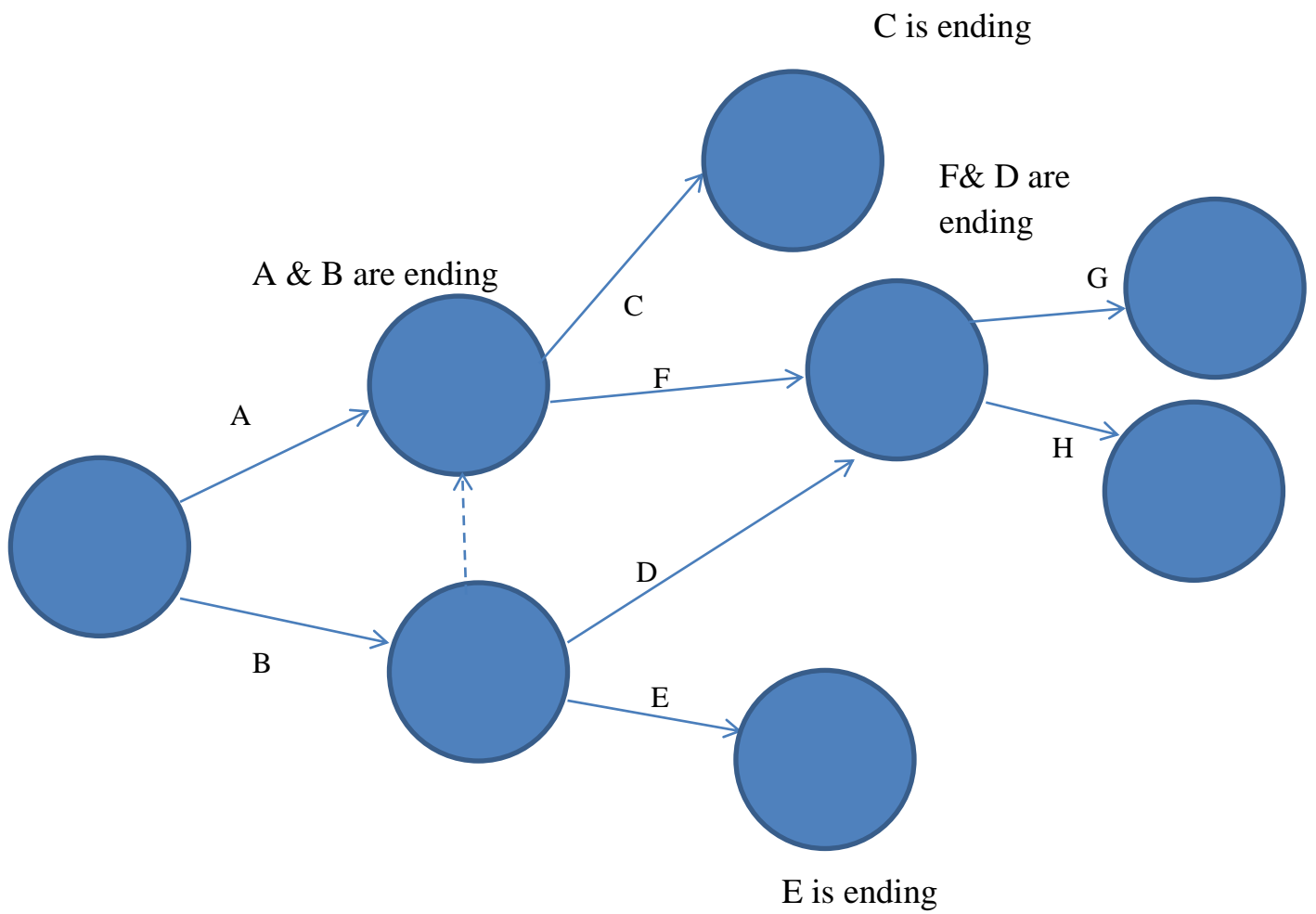
**The activity F needs to start from that node at which A&B will finish
simultaneously.**



**The activity G & H needs to start simultaneously from that node at which
F&D will finish simultaneously.**

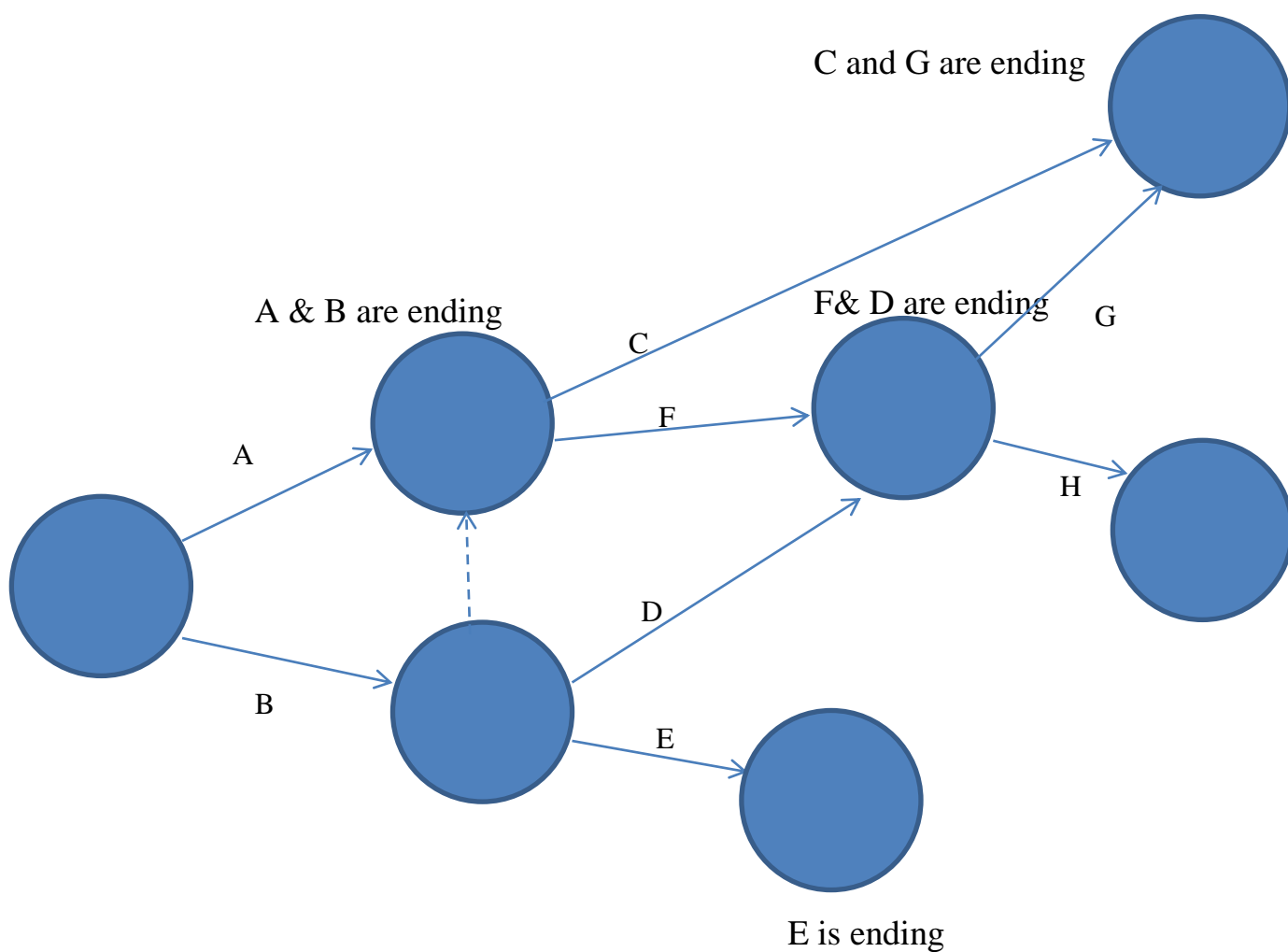
This implies that F&D needs to be finish at same node.

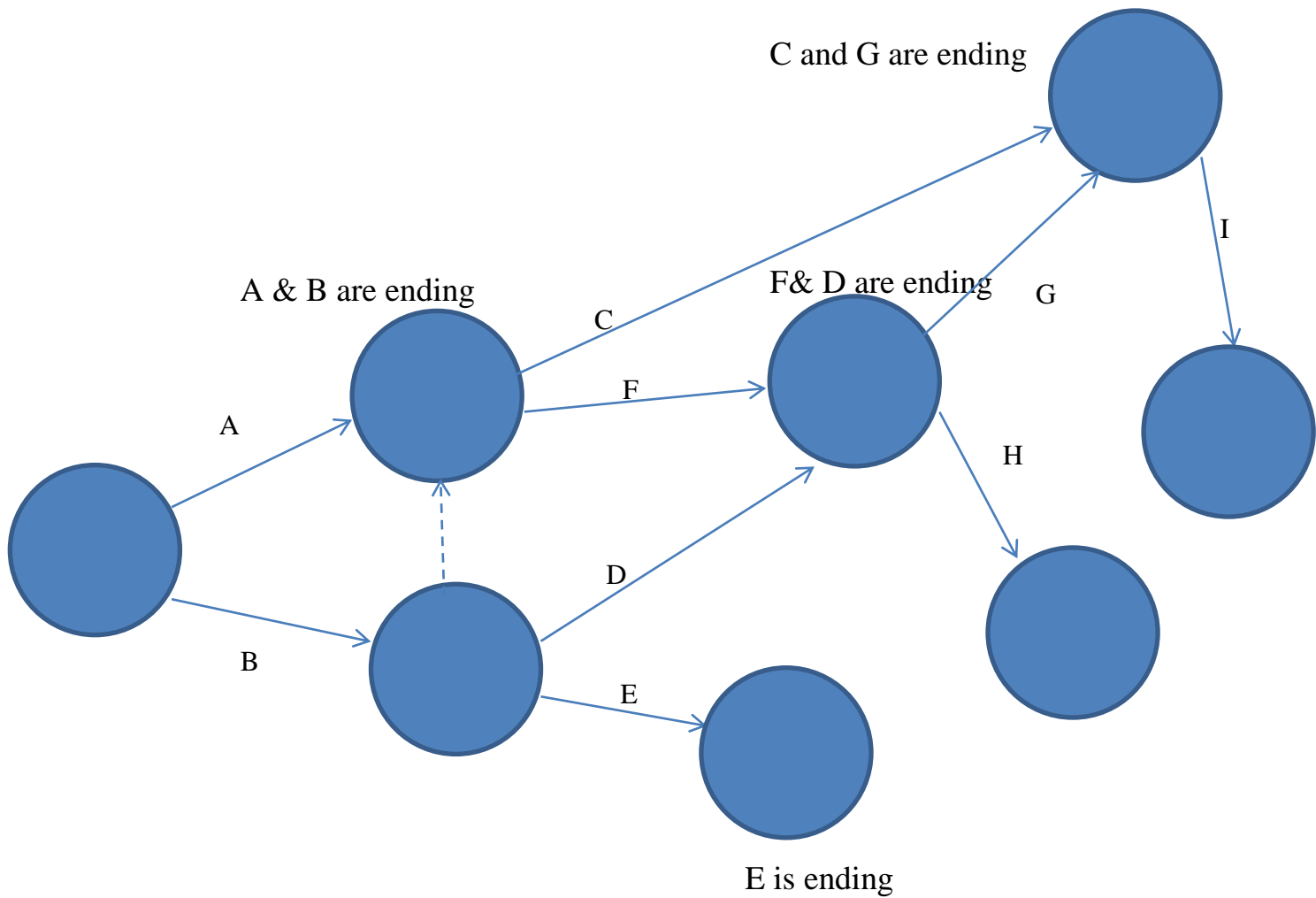




The activity I needs to start from that node at which C&G will finish simultaneously.

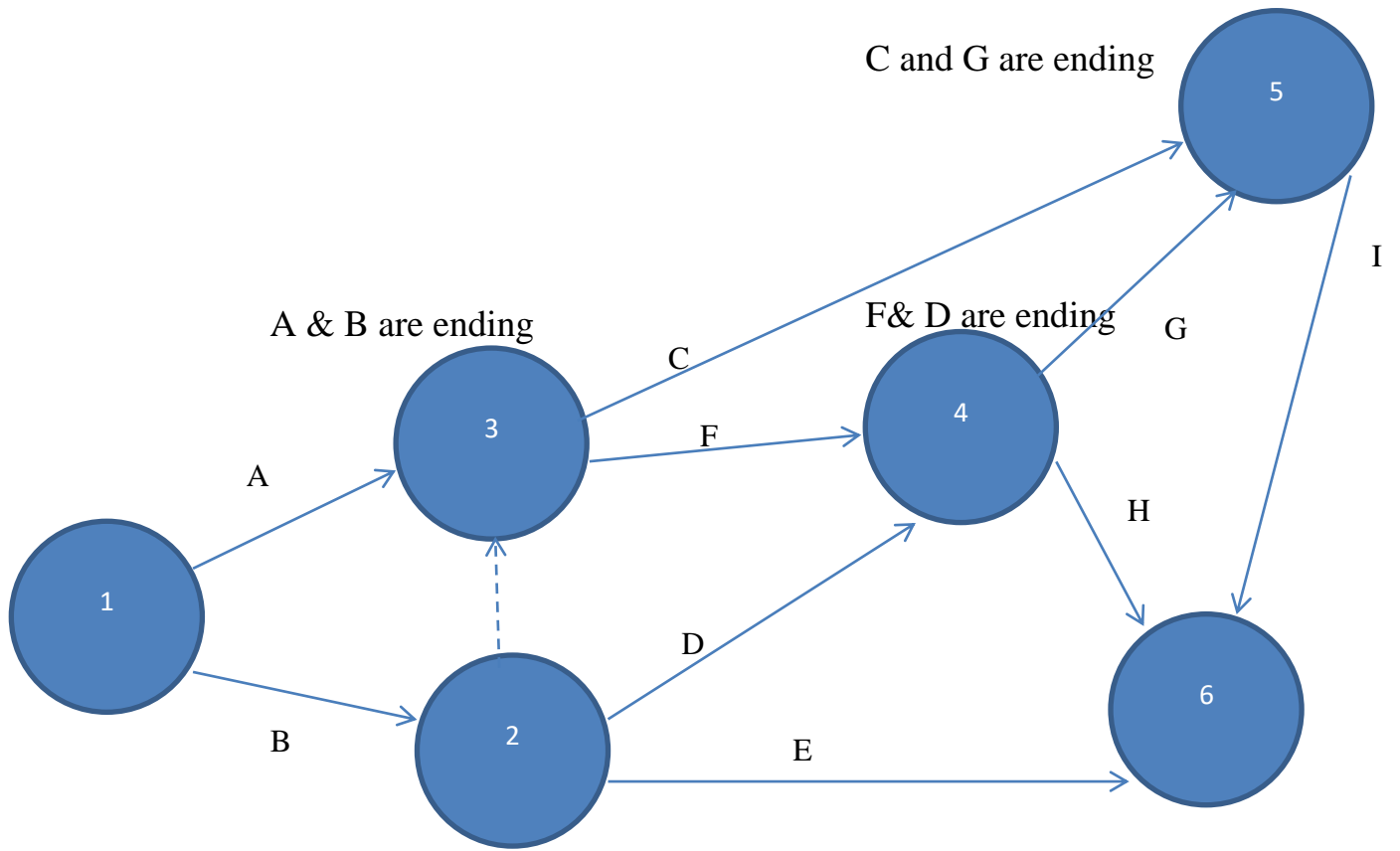
This implies that C&G needs to be finish at same node.





It is obvious that there are three destination nodes. While, according to rules destination node should be unique.

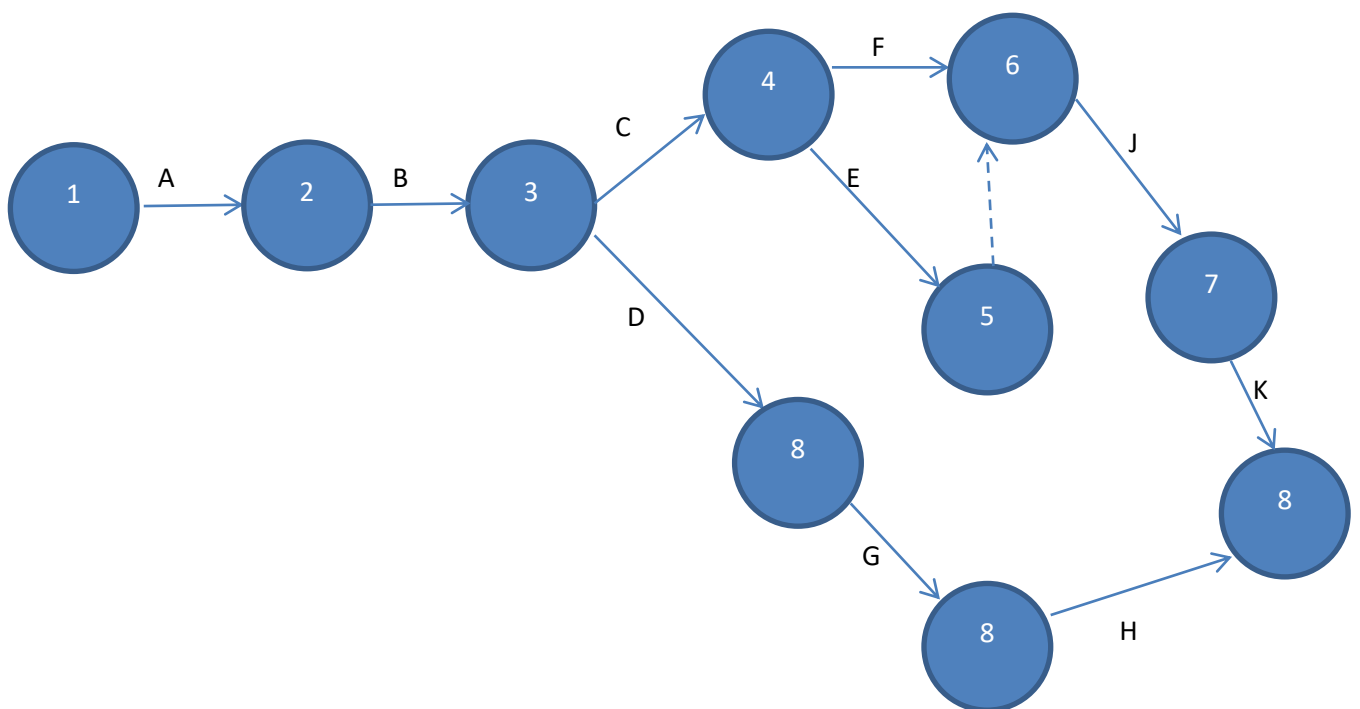
Hence, need to finish all E, H and I at same node.



Example:

Construct a network by considering the following information:

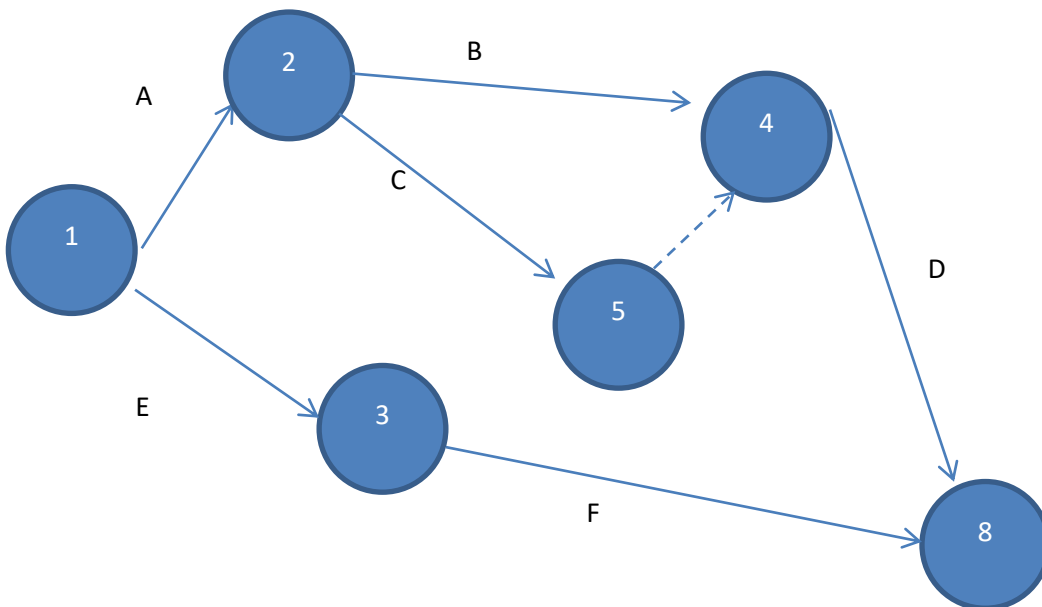
Activity	A	B	C&D	E&F	G	H	J	K
Predecessor(s)	-	A	B	C	D	G	E&F	J



Example:

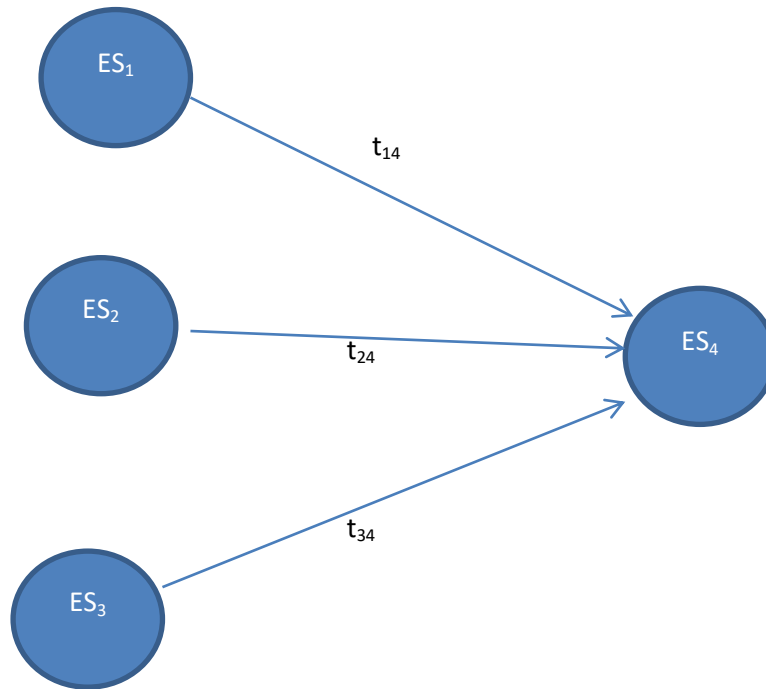
Construct a network by considering the following information:

Activity	A	B	C	D	E	F
Predecessor(s)	-	A	A	B&C	-	E



Earliest Starting time of an activity at a node

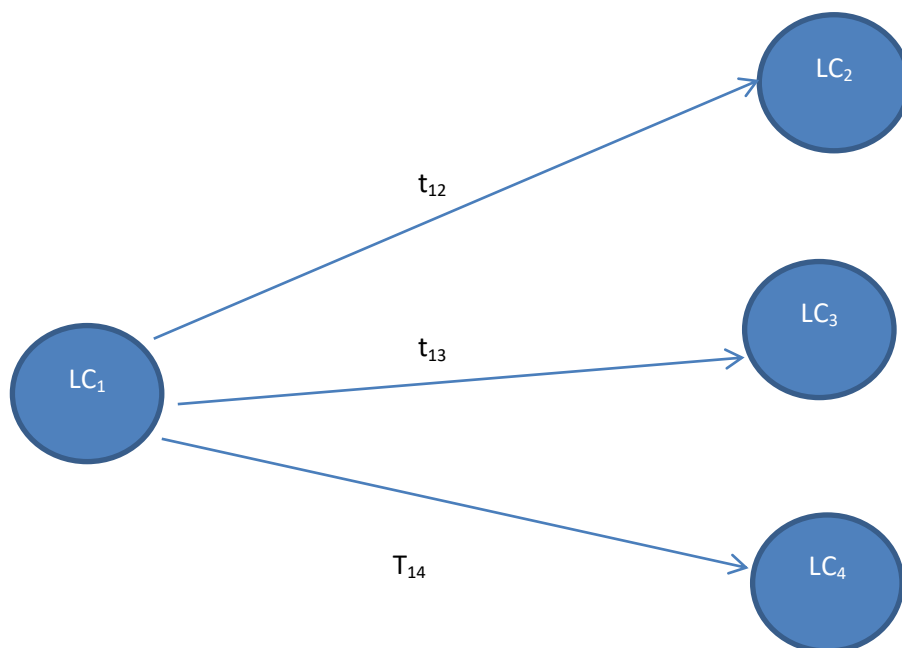
An activity at a node can be started at any node only when all the activities reaching at that node will be completed.



$$ES_4 = \text{maximum}\{ES_1 + t_{14}, ES_2 + t_{24}, ES_3 + t_{34}\}$$

Latest completion time of an activity at a node

The maximum starting time of all the activities at a node should be in such a manner that none of the activity should be late in reaching at its destination node.

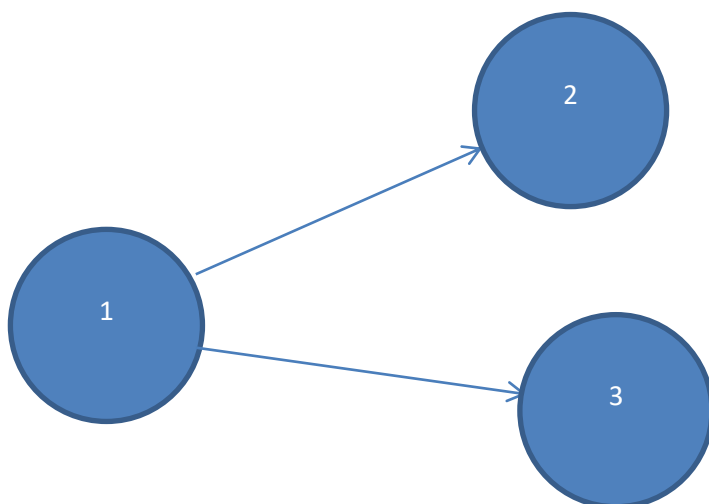
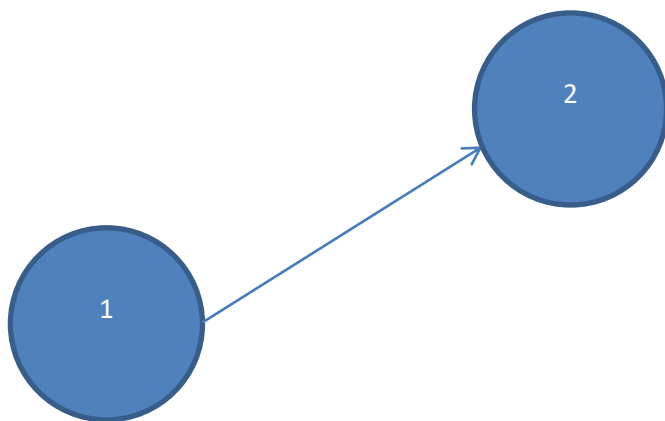


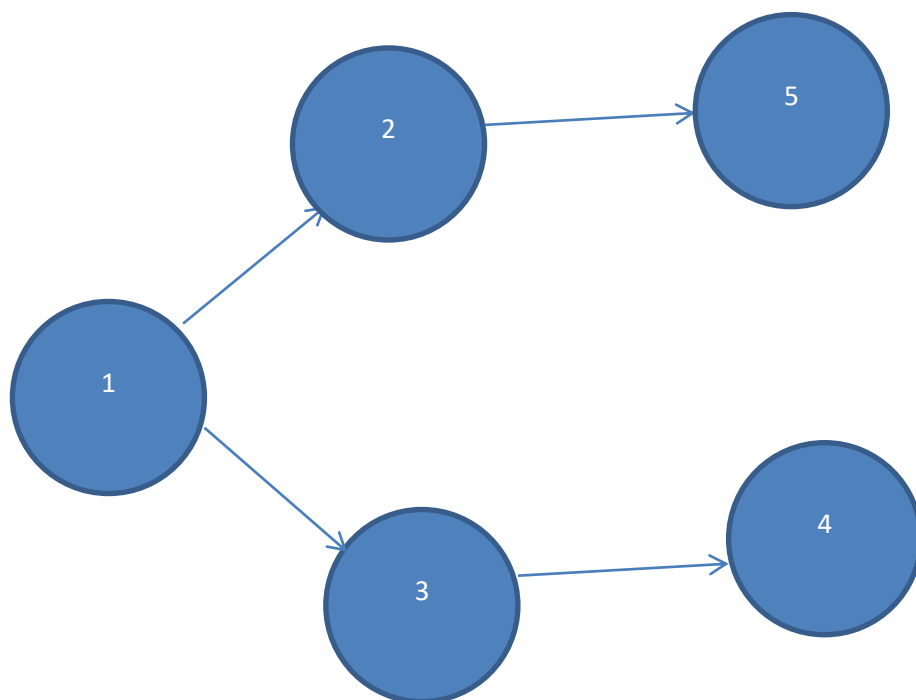
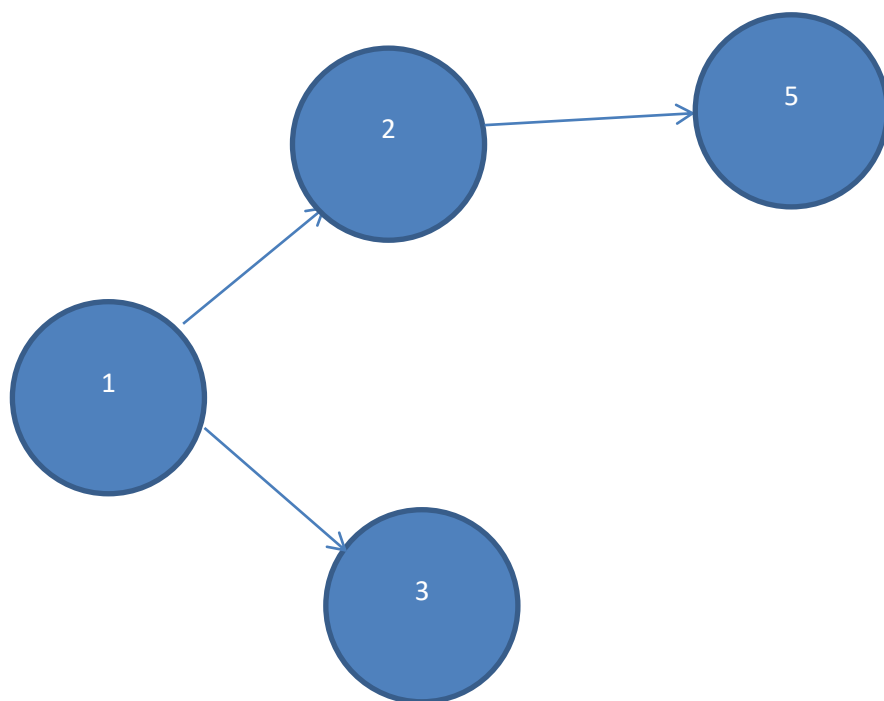
$$LC_1 = \text{minimum}\{LC_2 - t_{12}, LC_3 - t_{13}, LC_4 - t_{14}\}$$

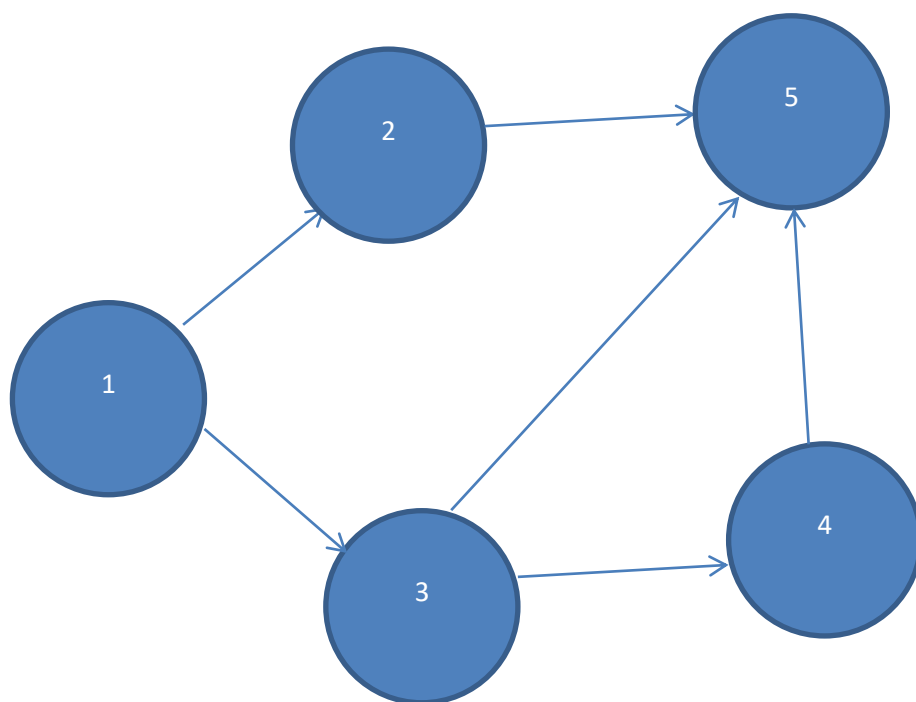
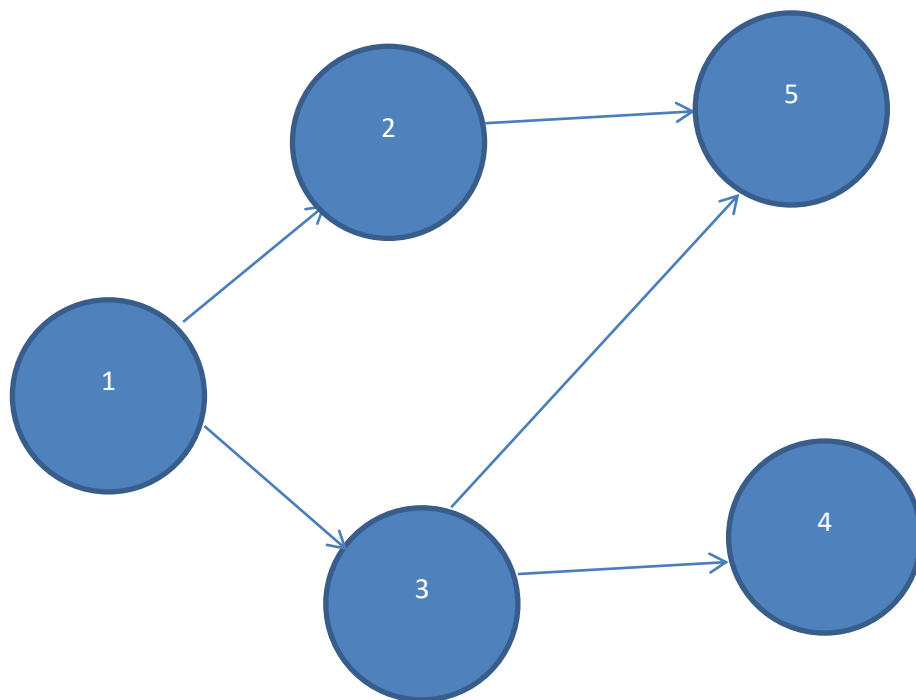
Example

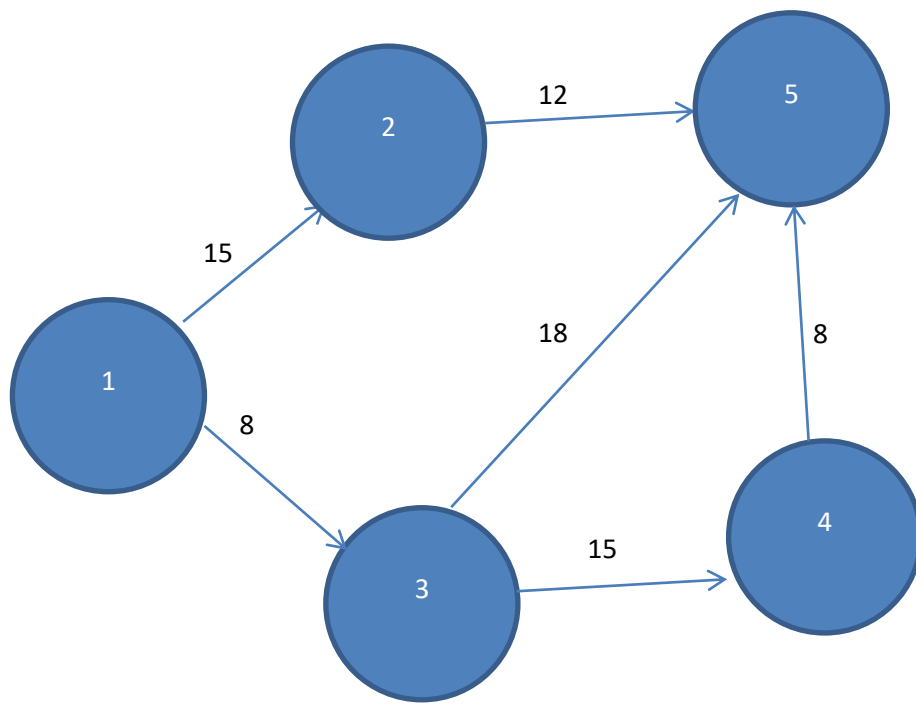
Activity (i,j)	(1,2)	(1,3)	(2,5)	(3,4)	(3,5)	(4,5)
Time	15	8	12	15	18	8

Construct network and find ES_i and LC_j .

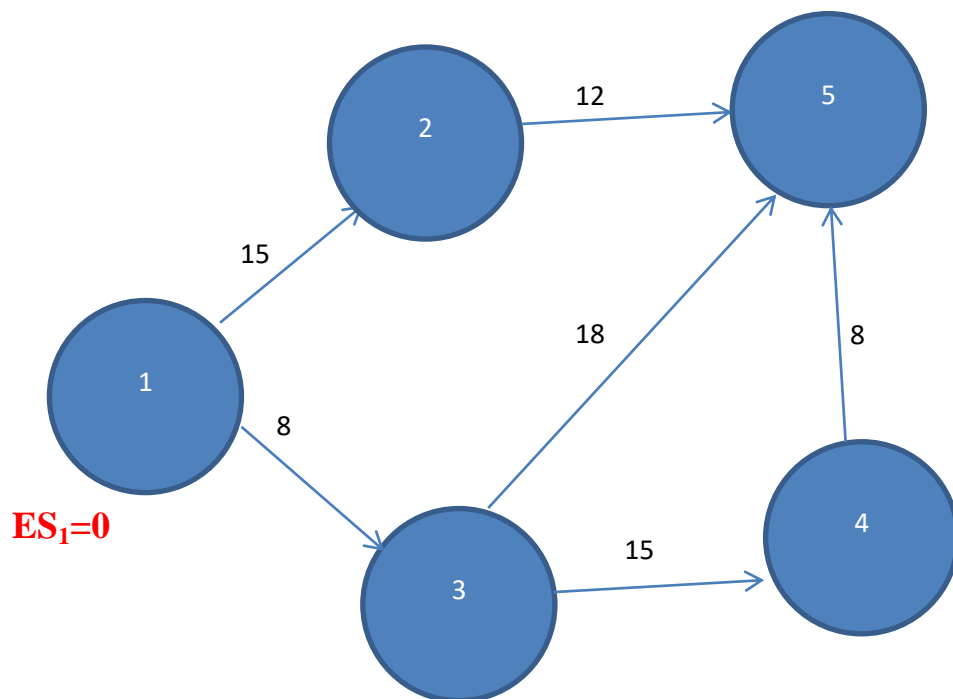


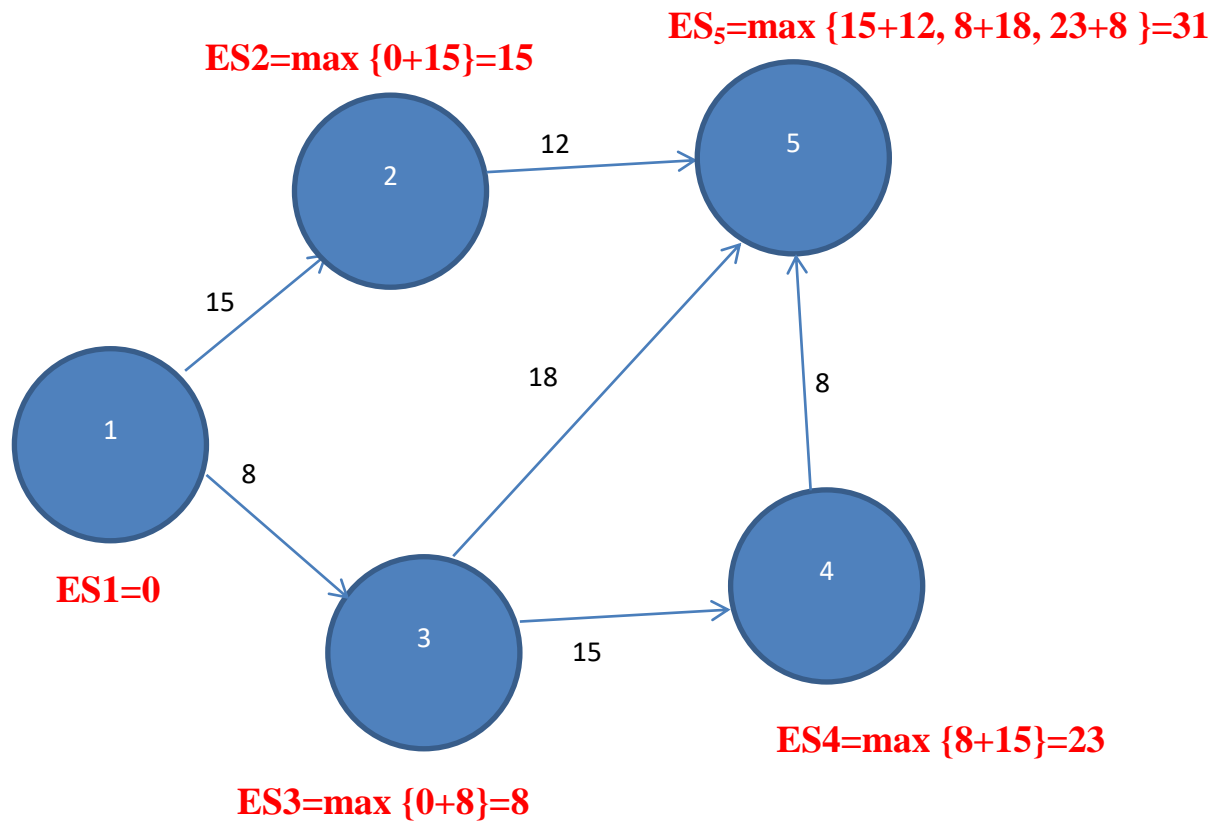






Assume $ES_1=0$





Asssume $LC_5=ES_5=31$

