Large Scale Systems Design
G52LSS

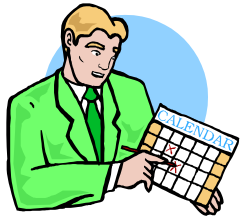
Lecture 6 – Project Scheduling With PERT

- Project Scheduling
- PERT Diagrams
- Constructing Pert Diagrams

Learning outcomes: describe the purpose and steps of project scheduling within the SDLC; understand the purpose of Pert diagrams; appreciate the differences between AoN and AoA Pert diagrams; understand the information given by Pert diagrams; draw AoN and AoA Pert diagrams given the precedence table.

Project Scheduling

Project scheduling is part of project management within the Planning phase of the Systems Development Life Cycle.



Project. Set of (concurrent/consecutive) activities or tasks with clear beginning and ending points aimed to achieve a specific goal. The amount of available resources (time, personnel and budget) to carry out the activities is usually limited.

Project Scheduling. Allocate resources to execute all activities in the project.

Objectives of Project Scheduling

- Establish beginning, ending and duration of each activity or task in the project
- Calculate overall completion time of the project given the amount of usually limited resources
- Determine the critical path and its duration
- Determine the slack time for all non-critical activities and the whole project
- Guide the allocation of resources other than time such as staff and budget
- Produce a tool (schedule) to aid the control phase of project management

Steps of Project Scheduling

- Define activities or tasks according to the project objectives and at various levels of detail
- Identify precedence relationships or dependencies
- Estimate time required to complete each task
- Draw the (AoA or AoN) PERT diagram inserting dummy activities if required
- Apply CPM to calculate earliest and latest starting times, earliest and latest completion times, slack times, critical path, etc.
- Construct a GANTT chart
- If necessary, re-allocate resources and re-schedule
- Continuously monitor/revise the time estimates along the project duration

PERT Diagrams

Pert diagrams (also called network diagrams) reflects dependence relationships between tasks in a project.

Activity-on-node (AoN) diagrams

- Maybe more than one single start and end node
- Nodes represent activities
- Arrows indicate precedence

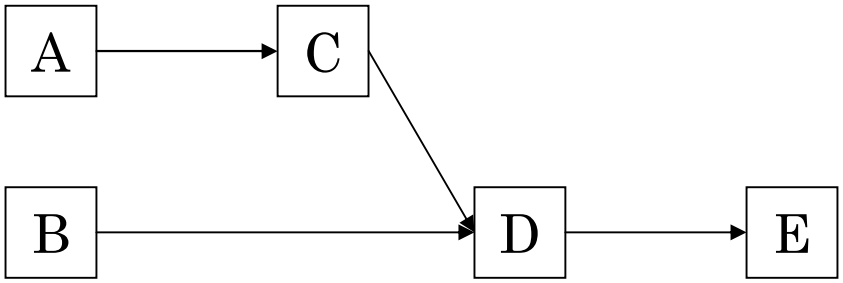
Activity-on-arrow (AoA) diagrams

- One single start and one single end node
- Arrows represent activities
- Nodes indicate beginning/end of activities

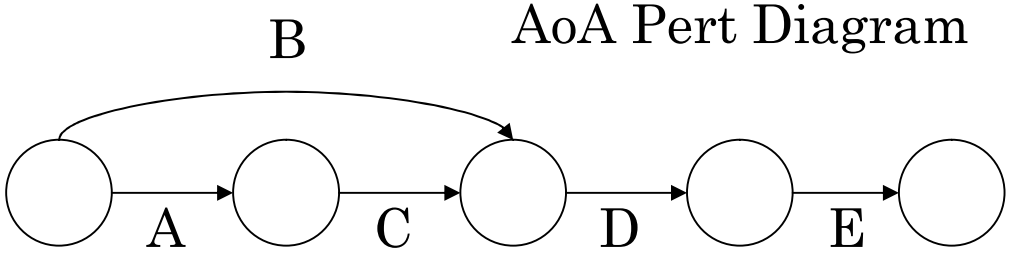
Example 6.1 of Pert diagrams

Task	Precedence
A	
B	
C	A
D	B,C
E	D

AoN Pert Diagram



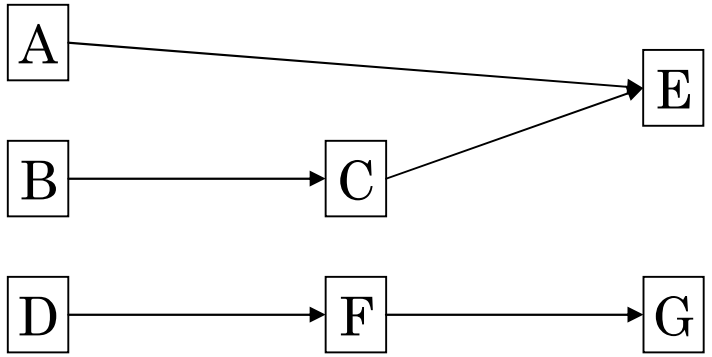
AoA Pert Diagram



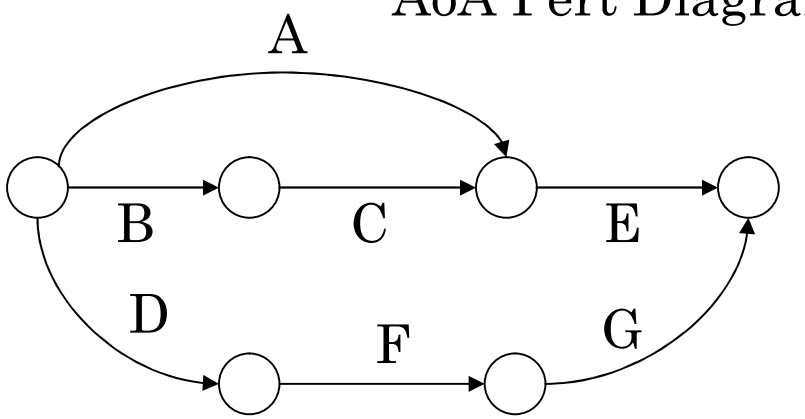
Example 6.2 of Pert diagrams

Task	Precedence
A	
B	
C	B
D	
E	A,C
F	D
G	F

AoN Pert Diagram



AoA Pert Diagram



Constructing PERT Diagrams

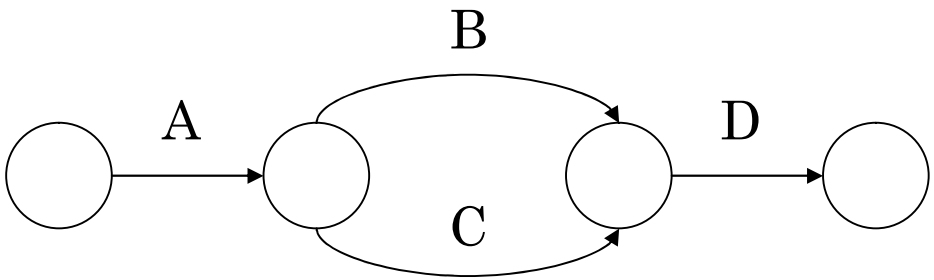
In AoA Pert diagrams, each activity must be uniquely identifiable by its start and end nodes. This means that the diagram must meet the following conditions:

- Two activities must not share the same start and end nodes
- No activity can have more than one start node or more than one end node. That is, there must be only one arrow for each activity

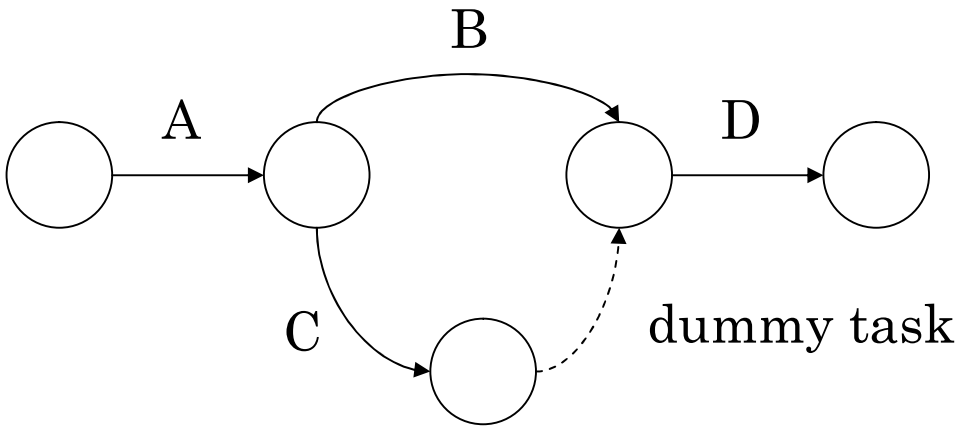
Sometimes it is necessary to insert dummy activities (duration zero) in AoA Pert diagrams in order to maintain the clarity of the diagram and/or the correct precedence between tasks.

Example 6.3 In this AoA diagram, two tasks are sharing the same start and end nodes.

Task	Precedence
A	
B	A
C	A
D	B,C

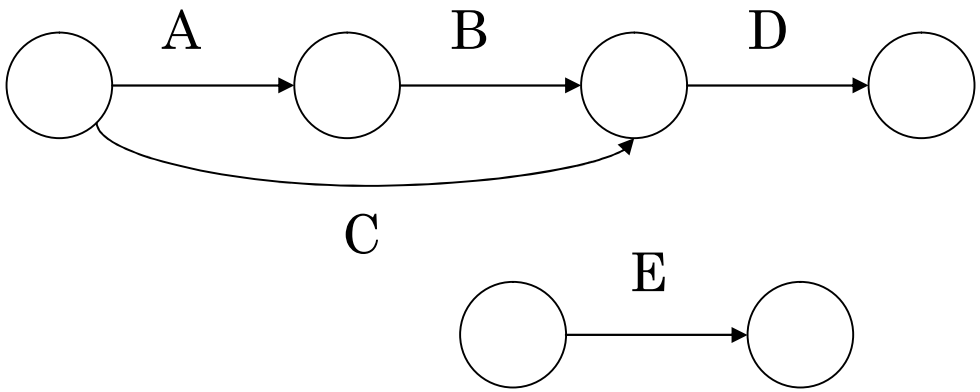


The solution is to insert a dummy task

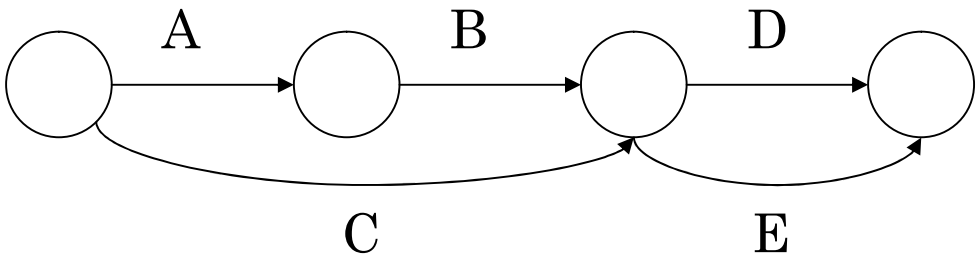


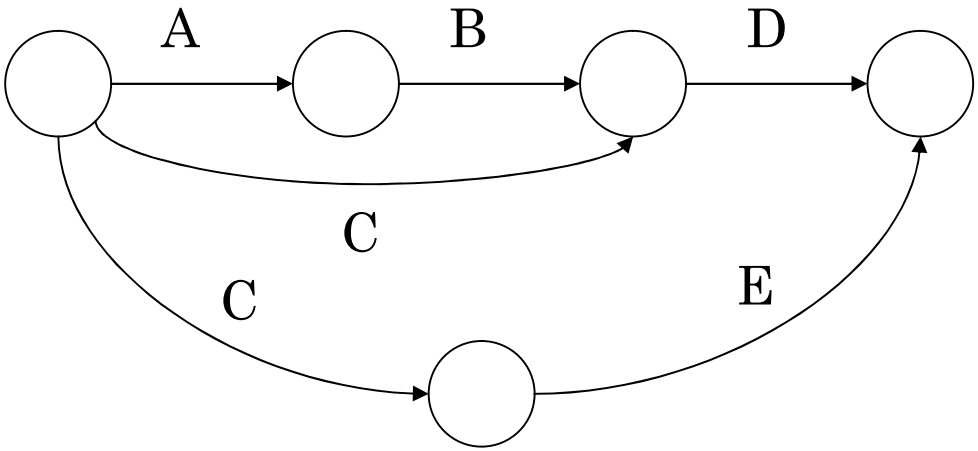
Example 6.4 In this Pert diagram, the difficulty is to insert activity E.

Task	Precedence
A	
B	A
C	
D	B,C
E	C



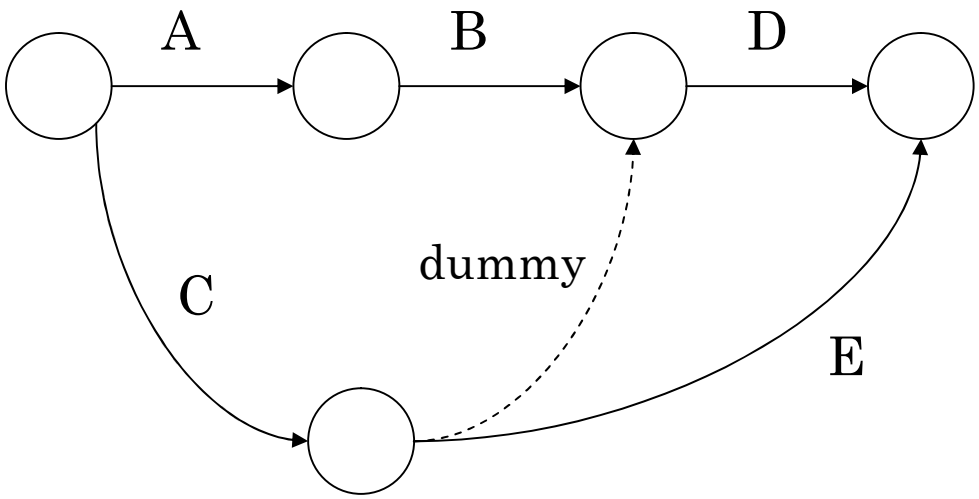
Example 6.4 (cont.) Inserting task E as shown in any of the cases below is incorrect.





Example 6.4 (cont.) The solution is to insert a dummy task so that the precedence of task E is preserved.

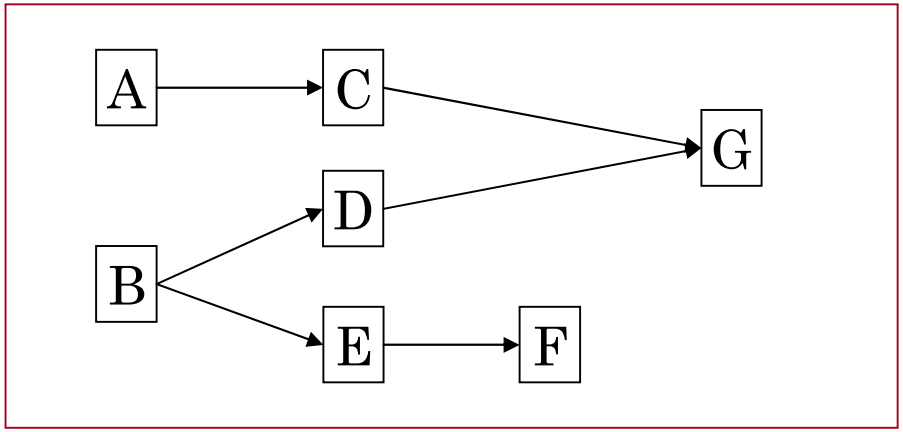
Task	Precedence
A	
B	A
C	
D	B,C
E	C



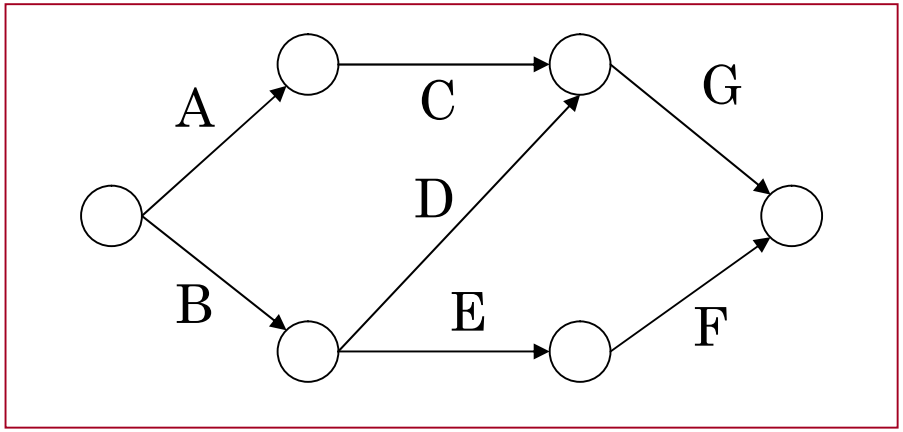
Exercise 6.1 Construct the AoN and AoA Pert diagrams for the following precedence table.

Task	Precedence
A	
B	
C	A
D	B
E	B
F	E
G	C,D

AoN



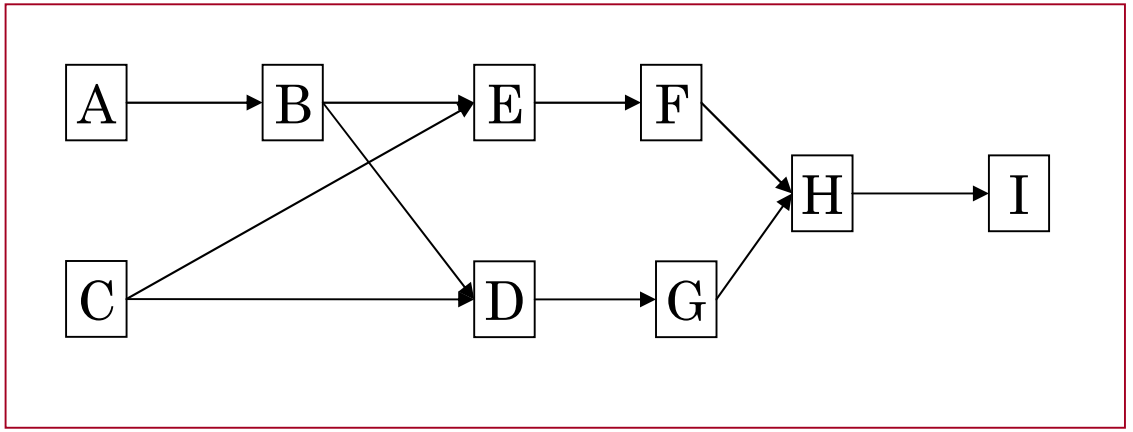
AoA



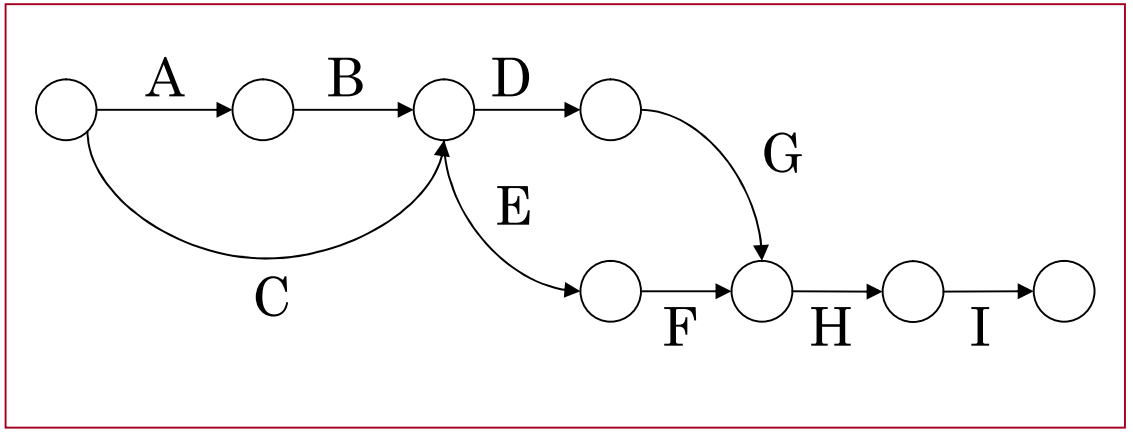
Exercise 6.2 Construct the AoN and AoA Pert diagrams for the following precedence table.

Task	Precedence
A	
B	A
C	
D	B,C
E	B,C
F	E
G	D
H	F,G
I	H

AoN



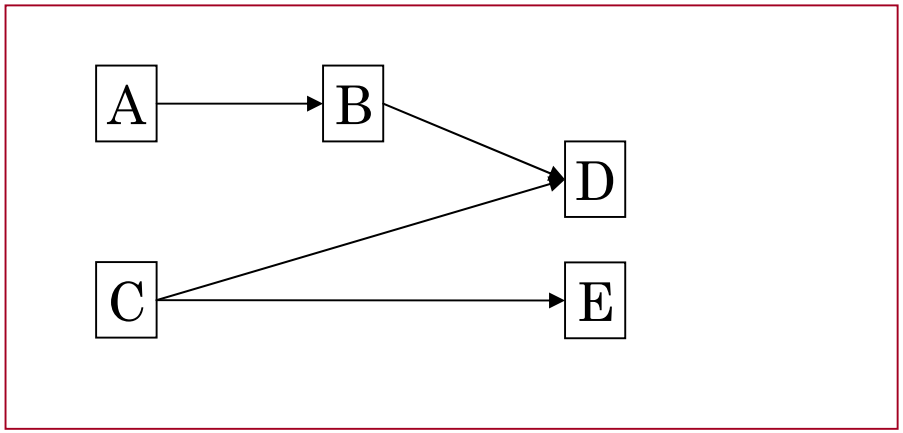
AoA



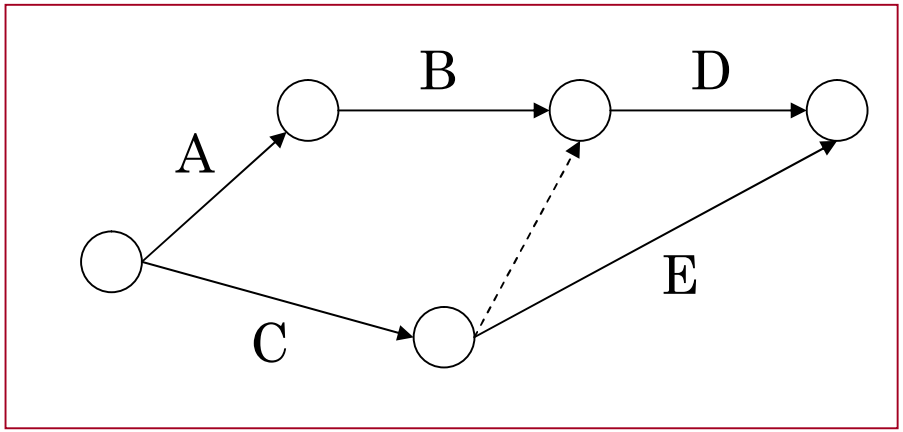
Exercise 6.3 Construct the AoN and AoA Pert diagrams for the following precedence table.

Task	Precedence
A	
B	A
C	
D	B,C
E	C

AoN

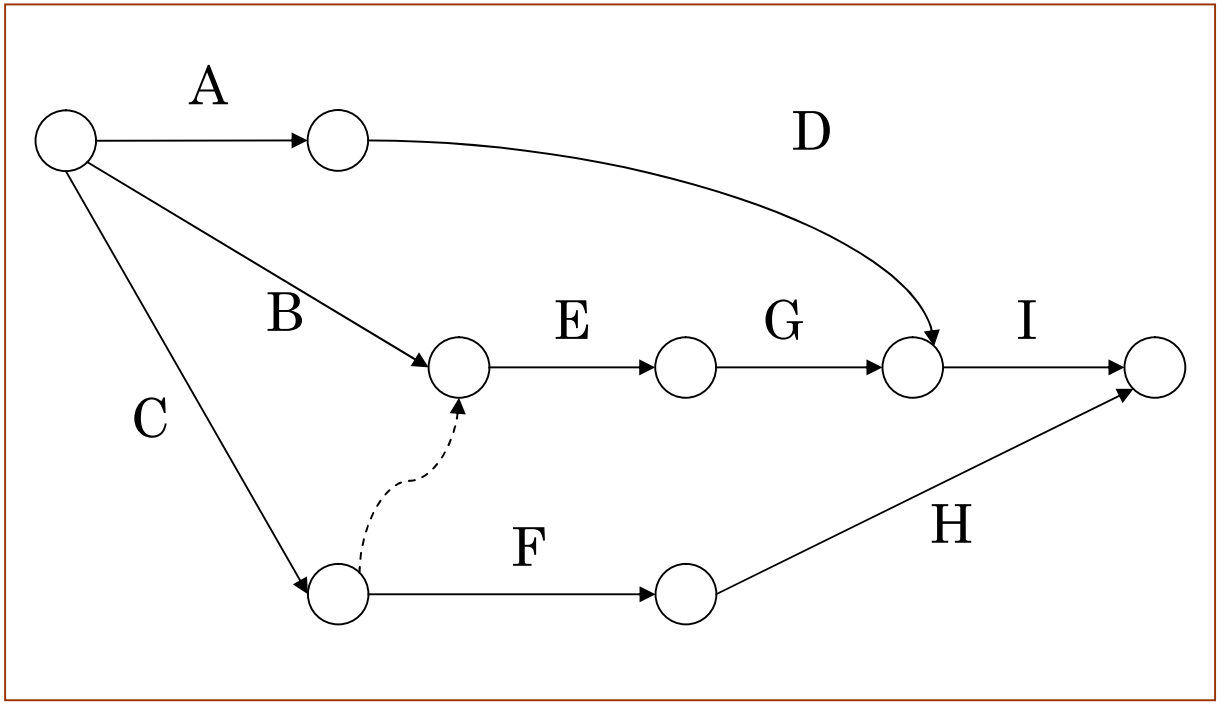


AoA



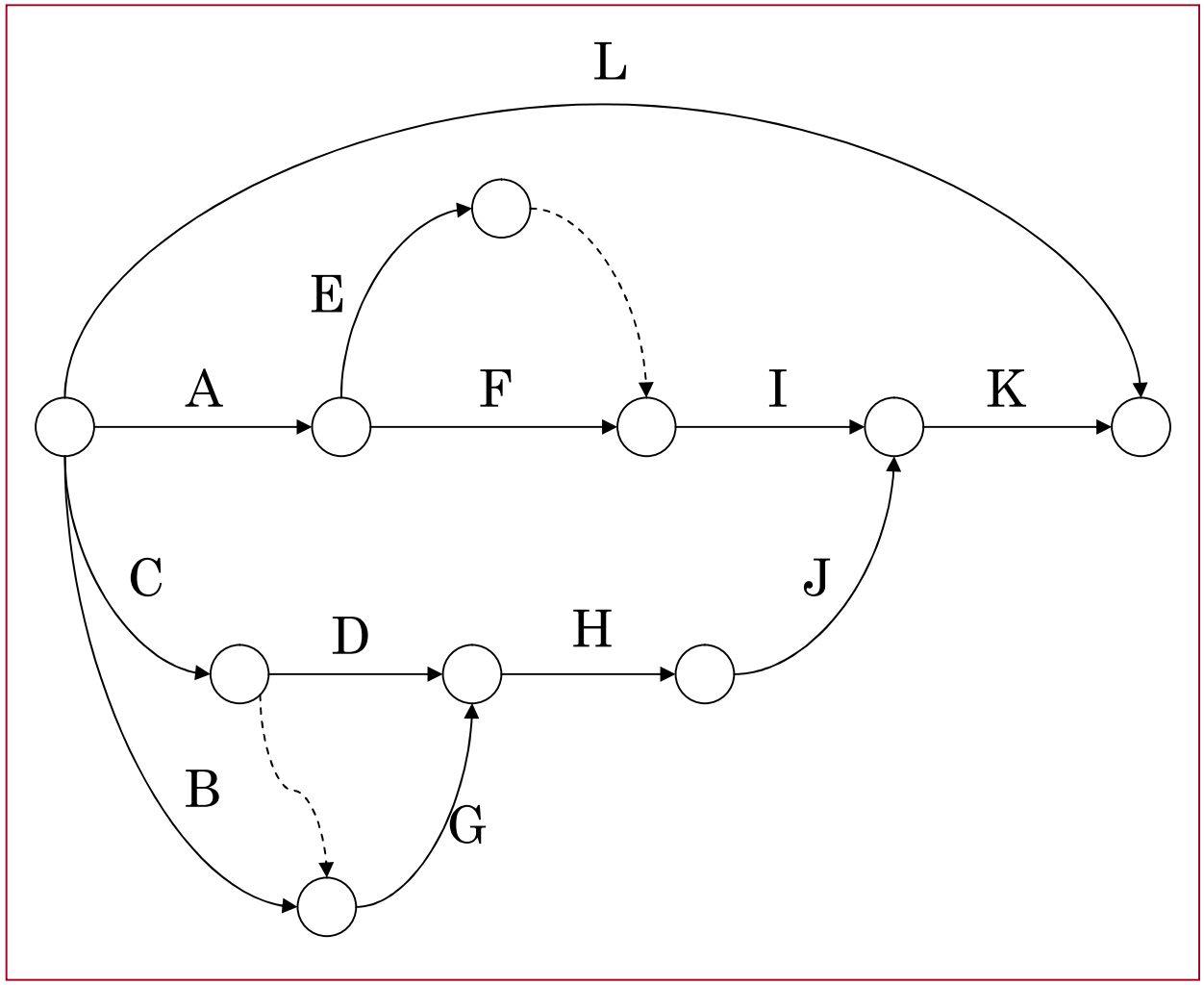
Exercise 6.4 Construct the AoA Pert diagram for the following precedence table.

Task	Precedence
A	
B	
C	
D	A
E	B,C
F	C
G	E
H	F
I	D,G



Exercise 6.5 Construct the AoN and AoA Pert diagrams for the following precedence table.

Task	Precedence
A	
B	
C	
D	C
E	A
F	A
G	B,C
H	D,G
I	E,F
J	H
K	I,J
L	



Additional Reading

Chapter 3 of (Dennis et al., 2006)

Chapter 3 of (Kendall and Kendall, 2005)

Chapter 5 of (Maylor, 2003)