Unit – II
PROJECT PLANNING AND SCHEDULING

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Network: It is a graphical and logical model or plan which lists out the **sequence of various operations** which are required to be performed for the final achievement of the project objectives.

Network techniques: This refers to method of **planning, scheduling & controlling** the **progress** on various components of projects, especially those projects which are complex in nature.

Terms & Definitions:

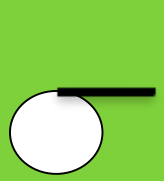
Activity-

- Any portion of a project which **consumes time or resources & has a definite beginning & an end** is called as an activity.
- It is denoted by an arrow. The symbol above arrow indicates activity description & the number below indicates activity duration in time units.

DURATION

Event-

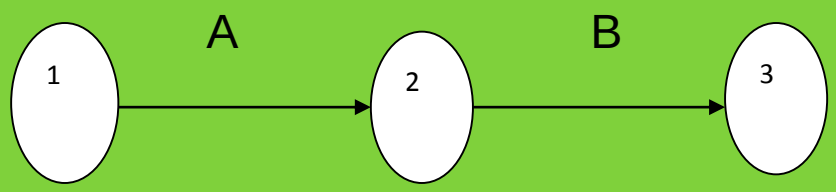
- The **beginning & the completion of activity** is termed as an event.
- It indicates a particular instant of time at which some specific milestone has been achieved. It does not consume any time or resources by itself.



Network logic-

This denotes the technical dependencies among the activities.

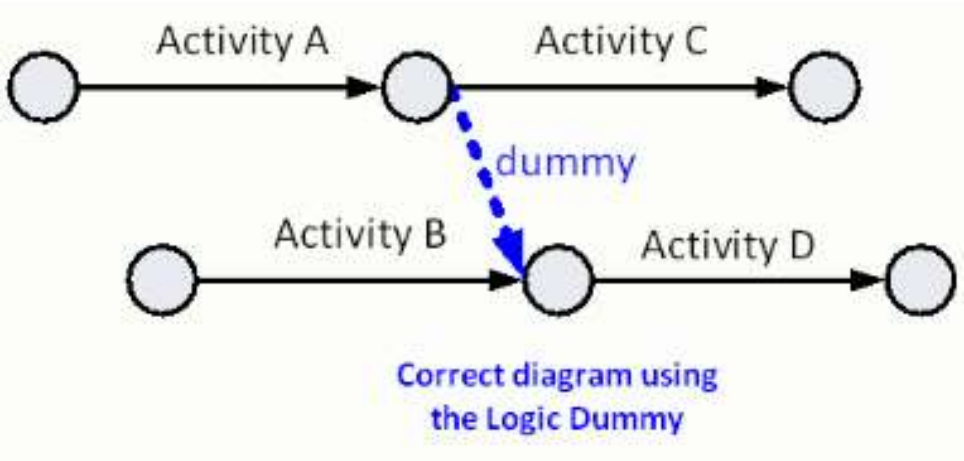
e.g. Network logic in the network drawn below is that activity A must be completed before activity B can be started.

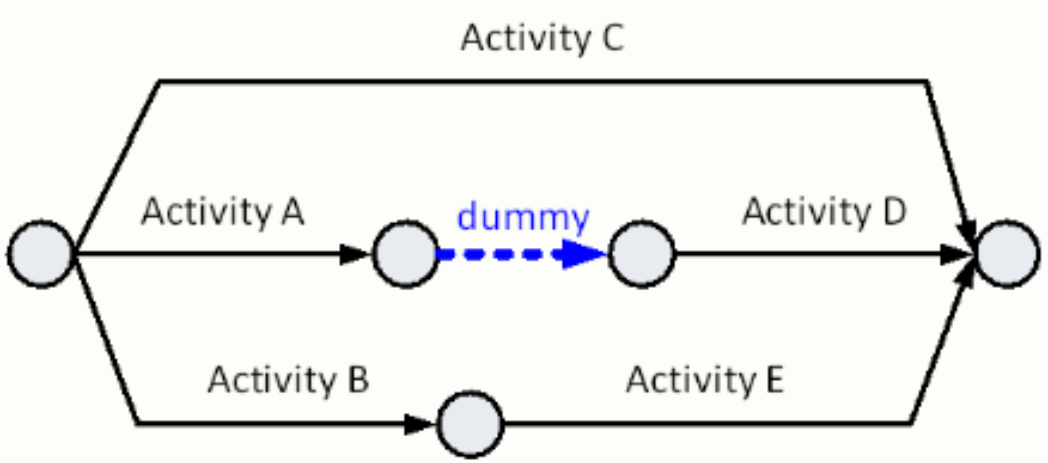


Series

Dummy-

- An imaginary activity with no duration, used to show either an indirect relationship between 2 tasks or to clarify the identities of the tasks.

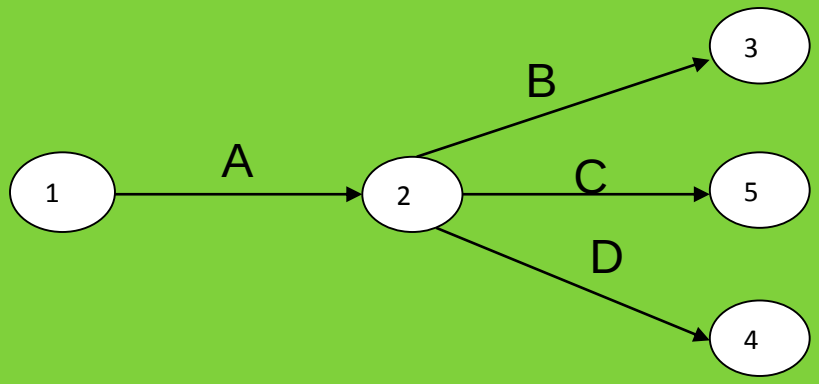

Activity A
Activity C
dummy
Activity B
Activity D
Correct diagram using
the Logic Dummy


Activity C
Activity A
dummy
Activity D
Activity B
Activity E

Types of event-

Tail event- an event which **marks the beginning** of an activity

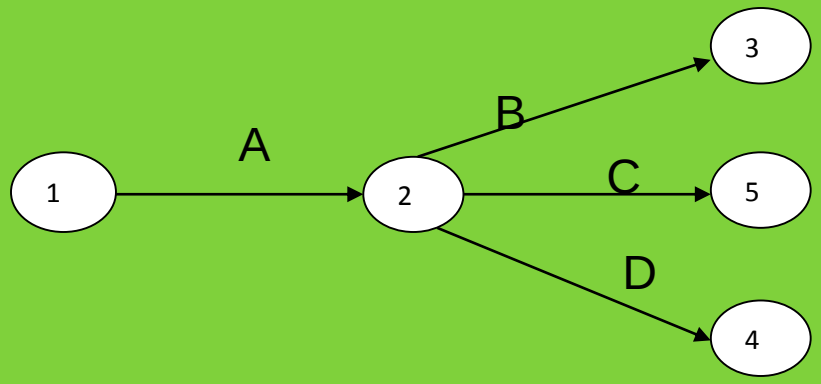
e.g. event 1 is said to be tail event to activity A as it indicates the beginning of the activity A.



Parallel

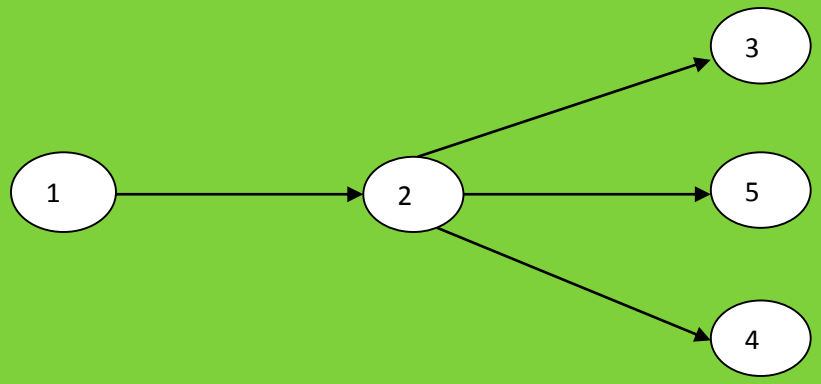
Head event- the event which **marks the completion of an activity**.

e.g. head event to activity A as it indicates the completion or end of activity A.

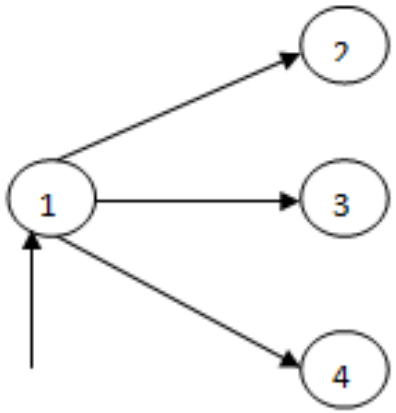


Dual role events- If an event acts as tail event for some activity & as the head event for some other activity it is called as dual role event.

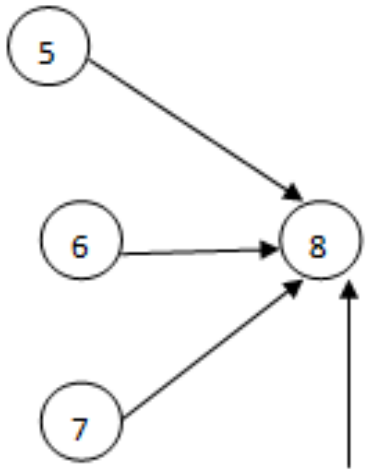
E.g. event 2 is a dual role event



- **Burst & merge event-** In arrow diagram there are some nodes to which number of activities converges & there may be others from which a number of other activities may diverge.
- The nodes to which number of activities converges are called as merge nodes or **merge events**.
- The nodes from which a number of activities emerge are called as **burst event or burst node**.

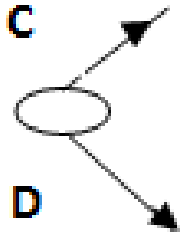


Burst event

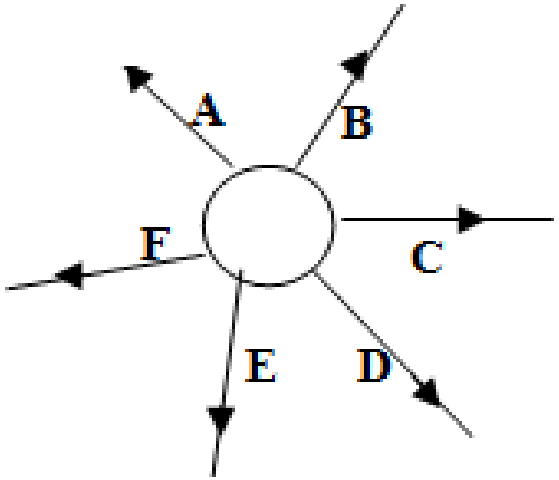


Merge event

Merge event



Burst event



Merge and Burst event

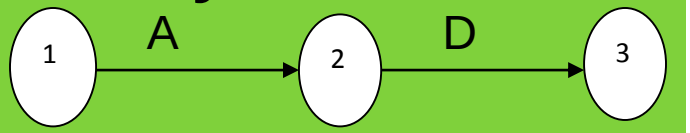
Inter-relationship of Events:

- **Successor event-** the event that follows a particular event in the sequence of their completion.

- **Predecessor event-** the event that occurs before a particular event in sequence of their completion.

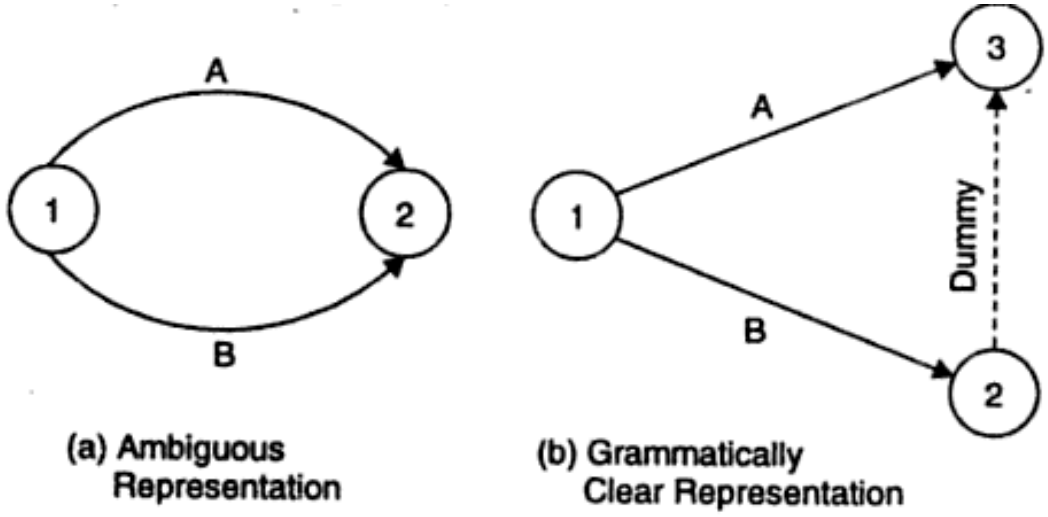
Inter-relationship of Activities:

- **Parallel activities or concurrent activities**- activities which can be carried out simultaneously & independent of each other. In fig activities B,C & D
- **Serial activities-** activities which can be performed only in succession i.e. one after other sequentially.



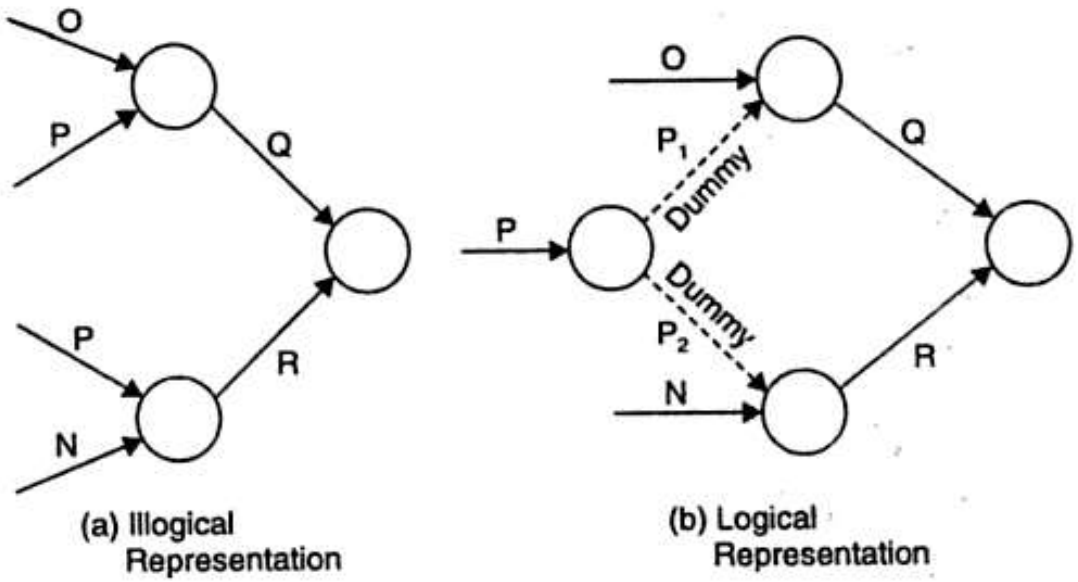
Dummy activity

- A Dummy activity is an imaginary activity. It does not exist in the Project activities.
- It is used in the network diagram to show dependency relationship or connectivity between two or more activities.
- It is represented by a dotted arrow.



(a) Ambiguous Representation

(b) Grammatically Clear Representation



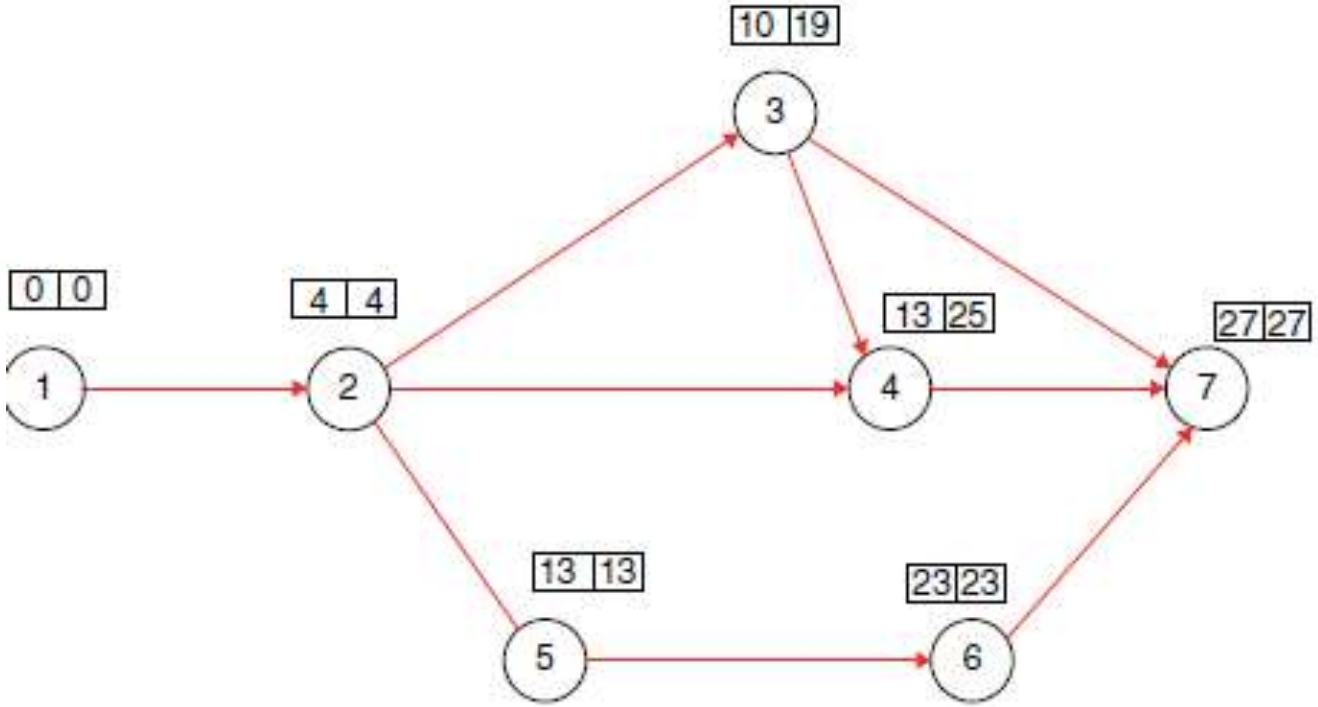
(a) Illogical Representation

(b) Logical Representation

FIG. 3.15. USE OF DUMMIES.

Network analysis

- Represents the activities
- To be completed and to estimate the duration of each activity.
- This network forms a flow diagram showing the logic behind the sequence of activities.
- Calculate the total time taken to complete the work
- The critical path through the network,



An example of an Activity-on-Arrow network diagram.

Types of network

- **Activity on arrow (A-O-A) or arrow diagrams**
- **Activity on Node (A-O-N) or precedence diagram or Event oriented network**
- **Event oriented network (PERT type)**

Activity on arrow

- Composed of arrows & nodes
- Arrows represent activities & nodes represent the events
- Each activity carries activity name, or symbol & the time duration.
- Easy to associate with time flow of activity
- A major difficulty to arrow diagramming is the dummy activity
- First method, popular method

Drawing the network

When drawing an Activity-on-Arrow network the following conventions are adopted:

- Time flows from left to right.
- Numbers within circles represent events.
- The arrowhead determines the direction of flow between events.
- Events are known as Head Events or Tail Events.
- Head events always have a number higher than the tail event.
- The length of the arrow has no significance and is not drawn in proportion to the anticipated duration.
- The orientation of the arrow has no significance. (Most planners prefer to use horizontal and vertical lines.)
- The description of the activity should be written upon the straight portion of the arrow.

Activity on node

- Nodes represent the activities & the arrows, their interdependencies or precedence relationships
- Nodes are represented by squares or rectangles, but circles may also be used
- Activity number & description are written within boxes representing the nodes
- Eliminates the dummy activity

Problems on Network Drawing

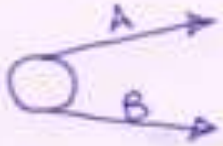
1) Draw the network for a project having four activities labelled A, B, C & D, & related as below:

   i) Activity A & activity B can be done concurrently.

   ii) Activity A is the immediate predecessor of activity C & so is the relation bet^{n} B & D.

   iii) Accomplishment of C & D marks the completion of the project.

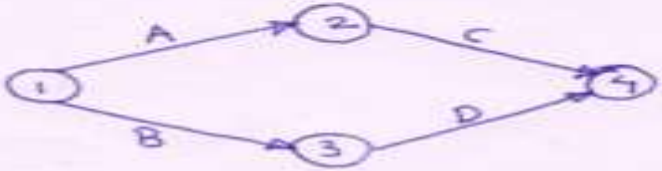
Sol.ⁿ : Step-I Activity A & B being done concurrently.



Step-II Activity C is the immediate successor activity A.

Step III Activity D is the immediate successor to activity B

Step - IV Accomplishment of C & D marks the completion of project. Thus final network is



2) A project consists of six activities (jobs) designated from A to F, with the following relationships -

i) A is the first job to be performed

ii) B & C can be done concurrently & must follow A.

iii) B must precede D.

iv) E must succeed C, but it cannot start until B is complete.

v) The last operation F is dependent on the completion of both. Draw network diagram.