

## Project scheduling :-

- \* planned event are schedule points in time during which participants exchange information
- \* unplanned event

↓  
occur due to certain crises like issues resulting from a combination of isolated facts they include

- (a) Request for clarification
- (b) Request for changes
- (c) Issue resolution.

## Scheduling objectives :-

- (i) Communicate the time estimate that is required for project completion.
- (ii) It sets tasks, deliverables, milestones & meetings.
- (iii) It contains commitments between team, between team & other staff & between stakeholder & the team.

Note: Here An end date for release of a system has already been established. & than distribute the efforts to complete the project in prescribed time frame

## Scheduling techniques:-

- (a) Network diagrams  $\rightarrow$  PERT, CPM
- (b) Bar charts — Milestone charts & Gantt charts.

## Scheduling Terminology :-

1. Schedule :- end & start date or time
2. Tasks :- well defined work
3. Activities :- group of tasks
4. Work product :- task result - piece of code
5. Work package :- result of activities
6. Event :- something that cause to change state
7. Synchronization events :- require team sync
8. Thrashing :- unproductive work
9. Task status :- completion or not completed
10. Network :- graphical representation of a project plan, showing the interrelationship of various activities.

## + scheduling techniques :- 1) has two methods

- (a) Network diagrams - PERT & CPM
- (b) Bar charts - milestone charts and gantt charts.

What is PERT ?

PERT ? (Project evaluation & Review technique)

History → PERT was originally developed in 1958 and 1959 to meet the needs of the "Age of Massive Engineering" where the techniques of Taylor & Gantt were inapplicable.

The special project office SPO of the U.S navy introduced PERT.

PERT → It is a technique of representing activities of projects in its proper sequence & timing. It is done by using PERT charts.

PERT charts represents a schedule as an acyclic graph of tasks.

- \* It is used to schedule, organize & coordinate tasks within a project.
- \* PERT charts are often constructed from back-to-front because for many projects end date is fixed and contractor has front-end flexibility.

## Main characteristics of PERT:-

1. It forms the basis for all planning  
- management can decide for best possible resources (cost, time, hardware, manpower) utilization.
2. It provides a basis for decision-making
3. It utilizes time network analysis technique as explained earlier also.
4. It provides the basic structure for reporting information.
5. It helps the management to understand the crucial elements in schedule according to date point of view.

## Why this method is used ?

1. To estimate the completion time of the project.
2. To find out project status behind, ahead or scheduled.
3. To compare resources used status.
4. To estimate critical activities.
5. To estimate activities that can be delayed without delaying project.

## Rules for Drawing PERT :-

1. \* Always draw arrows in straight line.  
(Avoid curve lines)
2. \* Draw arrows from left to Right. Avoid looping.
3. \* Always number the events in ascending order from left to Right. (1 to N)
4. \* Always use alphabets to denote an activities drawn by arrows. The duration in days/week/months etc. are indicated as numbers that are written under them.
5. \* Do not scale the length of arrows with respect to duration. (This is avoid looping & backtracking).

## How to Number Events :-

After the network drawn in logical sequence every event assign a number & which is place inside the node circle. Number sequence should be such that as to reflect the flow of the network.

These rule were given by D.R. Fulkerson.

To given number 10 events

1\* The initial event is numbered 1.

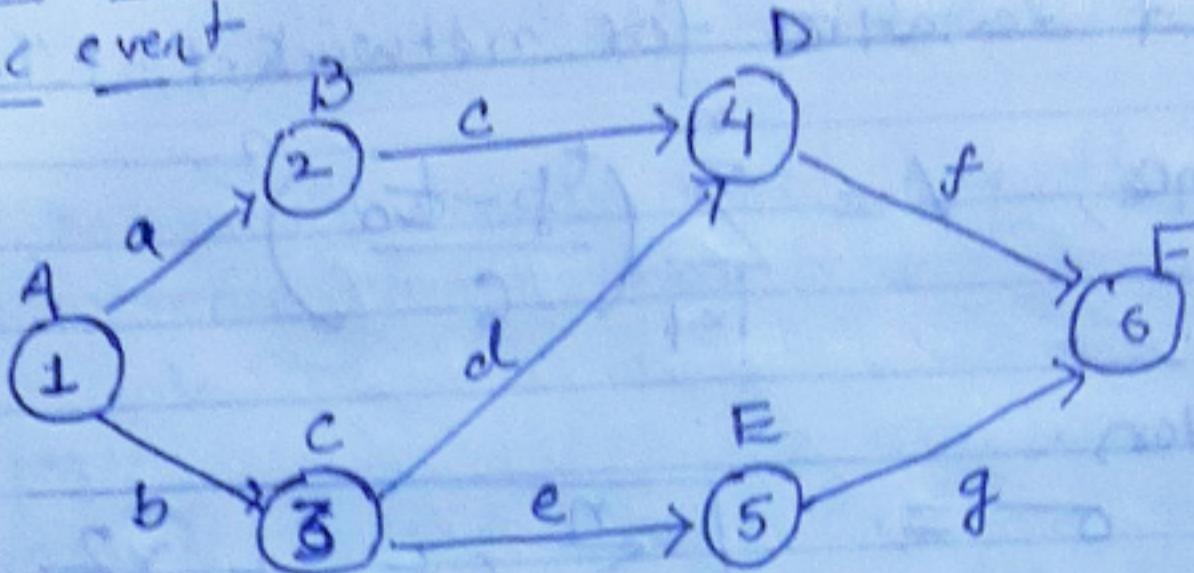
Note that : This initial event will have outdegree only. its degree will be zero.

2\* Generate all arrow going out from this node '1'. This will convert some more nodes (at least one), into initial events. we will number these event 2, 3, - .

3\* Generate all arrows going out from these numbered event to create more initial events. Assign the next numbers to these events.

4\* continue until the final (terminal) node is numbered.

logical sequence → activities  
A, B, C event



How this technique (PERT) works?

PERT Assumes the Activities to be deterministic and is based on a "three time estimate" of the average time required to execute the activity.

(1) Optimistic time ( $t_0$ ) a

(2) Pessimistic time ( $t_p$ ) b

(3) Most likely ( $t_m$ ) m

$$\Rightarrow \text{Mean } t_e = \frac{t_0 + 4t_m + t_p}{6}$$

$$\Rightarrow \text{Standard deviation } \sigma = \frac{t_p - t_0}{6}$$

$$\Rightarrow \text{Variance} = \sigma^2 = \left( \frac{t_p - t_0}{6} \right)^2$$

standard deviation for network: PERT.

$$\text{Variance, } V = \sum_{i=1}^n \left( \frac{t_p - t_o}{c} \right)^2$$

deviation

$$\sigma = \sqrt{\sum_{i=1}^n \left( \frac{t_p - t_o}{c} \right)^2}$$

where  $i$  to  $n$  are activities 1, 2, 3, ...,  $n$  which are lying along the critical path.

Step to be followed in PERT planning process.

steps:-

1. Identify the specific Activities & Milestones  
Activities - task required, Milestone - start to end date.
2. Determine the proper Sequence of Activities
3. Construct a network diagram
4. Estimate the Time Required for each Activity.
5. Determine the critical path. what is a critical Path?
6. Then calculate overall Variance & Standard deviation.

What is Critical Path :- In a network

there are many paths indicating the start & end events of the project.

The path which takes the maximum amount of time is called as the critical path. The activities which lie on the critical path are called as critical conditions.

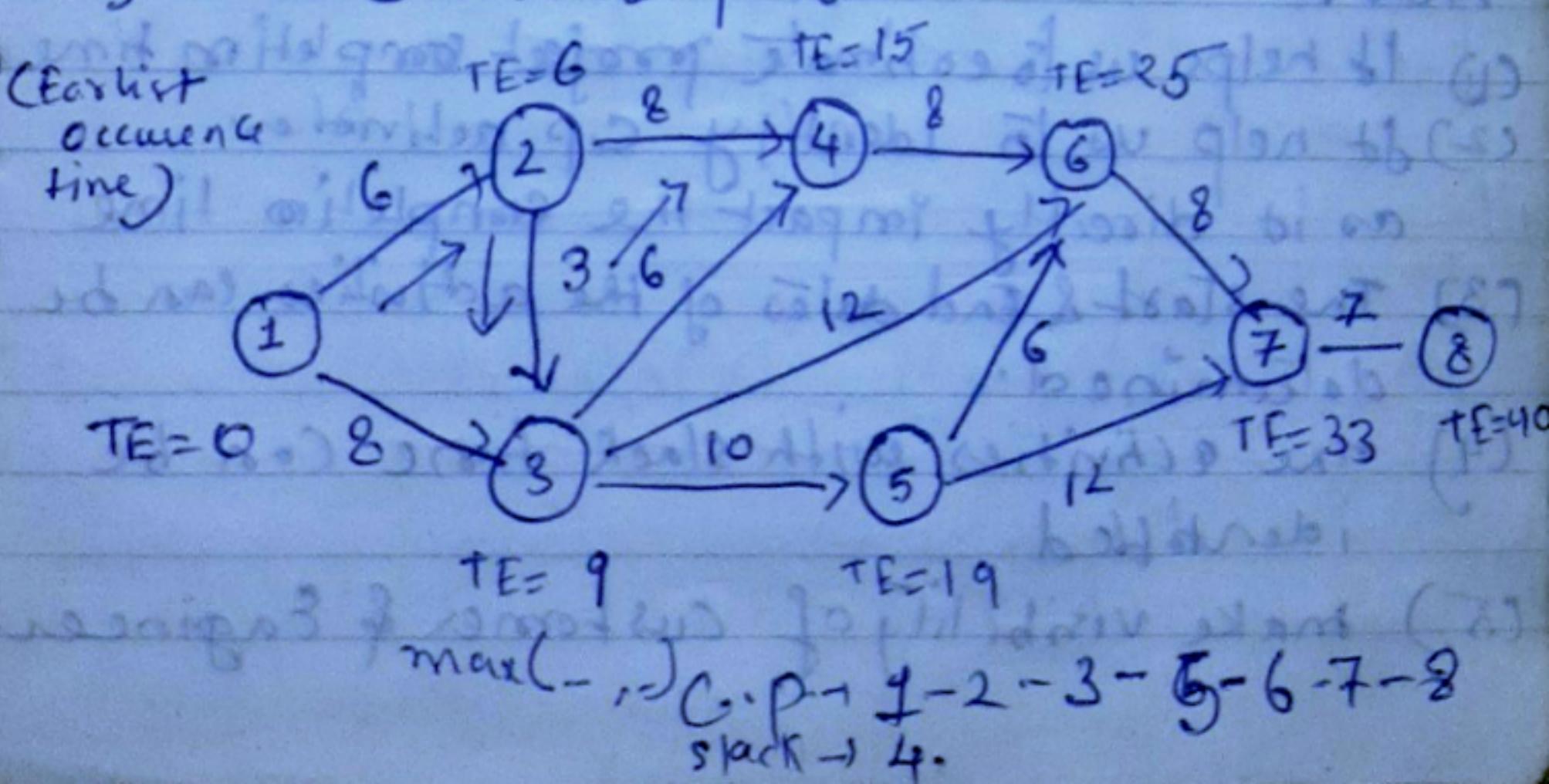
Note:-

# The amount of time that a non-critical path activity can be delayed without delaying the project is called as the slack time.

How critical path calculation is done?

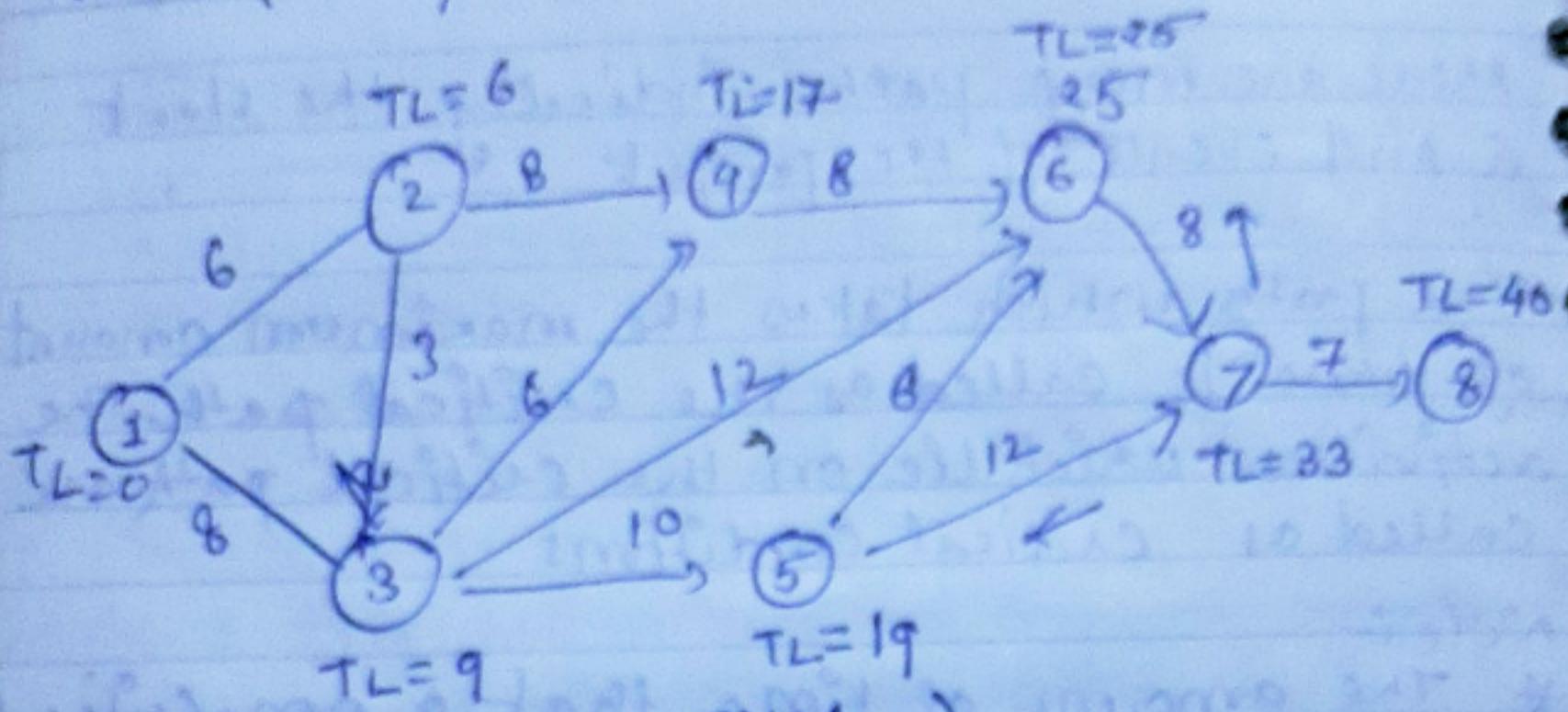
(1) The Forward pass.

(2) The backward pass.



To backward pass -

Last occurrence time = TL



$$\text{at } 4 \rightarrow TL - TE = 17 - 15 = 2 \text{ days}$$

Step 6 (F) - update the PERT chart or the project progresses.

Adv:-

- (1) It helps us to estimate project completion time
- (2) It helps us to identify CP activities as it directly impact the completion time
- (3) The start & end dates of the activities can be determined.
- (4) The activities with slack time can be identified
- (5) make visibility of customer & Engineer

disadv:

- (1) The activity time estimates are subjective. The number may be guess also. This is more error holds if there is little experience in performing an activity.
- (2) PERT is based on probability distribution (Estimating 3-time) of the project completion time is the same as that of the critical path.
- (3) PERT adds to the implementation problem.
- (4) It is expensive. suitable for long scale projects.