

4.10 CPM ANALYSIS

- Critical path method, commonly abbreviated as CPM, it closely resembles PERT in many aspects, but it was independently developed.
- M.R. Walker and J.E. Kelley of Ramination rand were involved in development of CPM for the construction of chemical plants in united states.
- Both CPM and PERT are the tools used now a days synonymously for planning, scheduling and controlling of various projects, through broad difference exists between them.
- The major difference between the two techniques is that CPM does not incorporate uncertainties in job times i.e. time estimate is deterministic.
- It assumes that activity times are proportional to the amount of resources allocated to them, and by changing the level of resources the activity times and the project completion time can be varied.
- CPM is mostly used in construction projects when there is prior experience in handling similar projects from which relationships between resources and job time are available.
- CPM then evaluates the trade off between projects and project completion time.

Table: Comparison between CPM and PERT.

PERT	CPM
(1) Network diagram is event oriented.	(1) Network diagram is activity oriented.
(2) It uses probabilistic approach and is suitable for research and development and non repetitive project.	(2) It uses Deterministic approach and is suitable for repetitive type of project.
(3) 3 time estimates are given for completion of an activity.	(3) Single time estimate is given for each activity.
(4) Follows distribution.	(4) Follows Normal distribution.
(5) Cost of project is directly proportional time and hence to minimize the project cost the project completion time is minimized.	(5) Cost model has to be developed using which min. cost of the project is found.
(6) Critical events are identified by using the concept of slack.	(6) Critical activities are identified by using concept of float.
(7) Critical path will be path joining the critical events.	(7) Critical path will be the path joining all the critical activities.

4.10.1 CPM – Networks

- Networking principals involved in CPM are similar to PERT.
- Main difference is that CPM networks are activity oriented where as PERT network are event oriented.

Time Estimate of an Activity

- After finalising of the network, our next step is to estimate the time required for the execution of an activity.
- As discussed before time estimation can be done in two ways (a) probabilistic approach and (b) Deterministic approach.
- PERT uses probabilistic approach to absorb the uncertainties associated for the achievement of events. Where as CPM is concerned with problems which do not involve significant uncertainties and hence deterministic approach is used.
- Both the above noted approaches for obtaining time estimate of an activity are presented graphically.
 - (a) The time estimate of an activity has greater range of variation and hence greater uncertainty, therefore probabilistic approach is used.
 - (b) Time estimate of an activity has a narrow range of variation and hence in this case time estimate is deterministic.

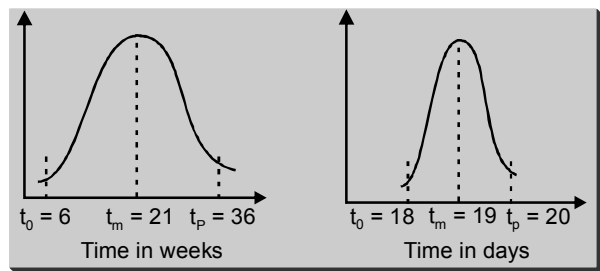


Fig. 4.46

- In CPM estimated activity time is represented simply by t_e , is directly used for network analysis.

Note: In CPM the time of completion for any activity $i-j$ is denoted by symbol t_e^{ij} , where as in PERT it was t_e^{ij} .

4.10.2 Start and Finish times of Activity

As the CPM networks are activity oriented, therefore the following activity times are useful for network analysis.