PERT & CPM

[GATE → (3-4) marks
ESE → (15-20) marks obj.
→ (40-50) marks conven.]

→ Topics;

1. Project Management
2. Fundamentals of Network
3. PERT
4. CPM
5. Crashing
6. Updating
7. Resource Allocation
8. A.O.N. Diagram
9. Engineering Economy
10. Construction Equipments

→ Part of GATE exam

→ Part of ESE exam

Project Management

Project: Project is a temporary endevaur undertaken to provide a unique Product, Service or result. [Output may be Product, service, result (in this form)]

> A project involves series of activities which consumes resource & time.

> Objectives of project:

i) Project should be completed in minimum amount of time

) Project should use locally available manpower & recources

) Project should finish on time with minimum investment cost.

> Project management:

Project management is application of knowledge, skill, tools & Techniques to meet the requirement of project.

> Elements of Project management :-

) Planning:

→ Planning is the most important technique of project management

→ Planning means defining the objectives of project and to identify different tasks & resources required for timely completion of project.

→ In Planning Phase Plan is made along with Work Breakdown Structure (WBS) and Organizational Breakdown structure (OBS).

→ WBS & OBS identifies group of activities required to achieve the project goal as well as responsibility of project team.

) Scheduling:

→ Scheduling is the process of fixing order of all the activities and allocation of resources to all the activities.

→ Ex:- Resources:

4 M's → Manpower
→ Machine
→ Material
→ Money & Space, time etc.

iii) Controlling ;

→ Controlling is the process perform to observe project execution such that potential problems can be identified in a timely manner and corrective measures can be taken whenever required

Note :-

→ Planning & Scheduling are done before start of project where as Controlling is done during the execution of project.

iv) Directing ;

→ It is function of project leader to give instructions to subordinates, to supervise their work and respond to reports of subordinates.

v) Coordinating ;

→ It is the process of interation between various department of project.

vi) Organizing ;

→ It is integration of resources

* Methods of Scheduling ;

1. Barchart / Gantt chart ;-

→ It was introduced by "Henry Gantt" in arount 1980.

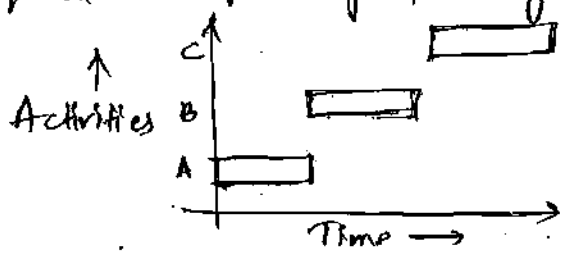
→ It is a graphical representation between activity and time.

→ Activities are shown with the help of bar

→ Begining of bar → start of an activity

End of bar → Completion of an activity.

length of bar → Time required for completion of an activity

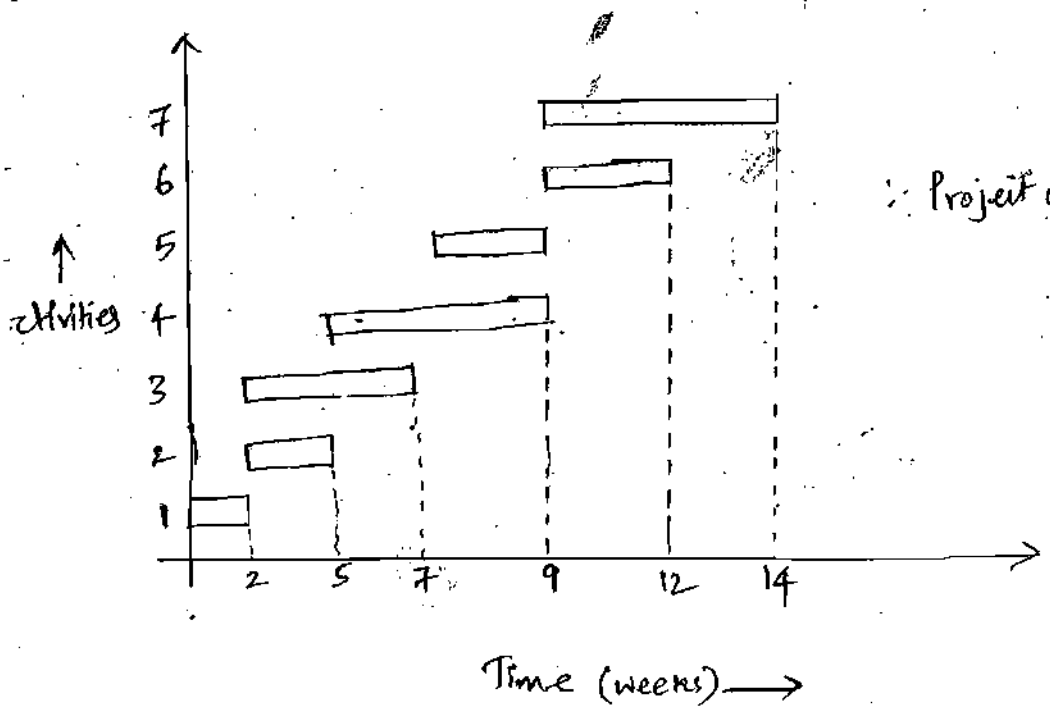


2:- For a construction project certain activities are to be performed as given below.

Activity No.	Time (weeks)
1	2
2	3
3	5
4	4
5	2
6	3
7	5

Activity ② & ③ can be performed simultaneously & can start only after completion of activity ①. Activity ④ can start only after activity ② ends. Activity ⑤ cannot begin unless activities ② & ③ are completed. Activity ⑦ is the last activity & this can start only after completion of activity ⑤. Draw a bar chart & Determine Project Duration ?. [activity ⑥ can start only after ④ & ⑤ are completed].

Sol:-



∴ Project completion Time = 14 weeks

→ Advantages of Barchart :-

i) Simple to draw and easy to understand

ii) No great scale is required

iii) It can be used for determining resources requirement at a particular stage of project with the help of which progressive cost of project can also be determined.

iv) Project progress can be expressed in terms of percentage

→ Limitations of Barchart :-

i) Lack of degree of detail

→ In case of big projects, only major activities can be shown otherwise it may become overcrowded, Hence barchart are not preferred "Big projects"

ii) Review of project progress

→ With the help of barchart project progress cannot be reviewed. Hence it cannot be used as a control device

iii) It doesnot show interdependencies between various activities

iv) It is not useful for those projects where uncertainity is involved in estimation of activity time.

ex:- Research & Development projects.

v) Barchart does not show critical path of the project

vi) It doesnot allows cost optimisation, i.e, crashing

2. Mile stone Chart :-

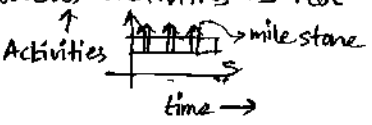
→ Mile stone chart is an improvement over original bar chart

→ In any activity there are certain key events which are to be carried out for the completion of an activity, such key events are called as "Mile stones"

→ Milestones can be represented with the help of arrows, square, circle

→ If a particular activity is very long then details of subactivities will be lacking, then details of these subactivities can be shown with the help of mile stones, which helps in better controlling of project.

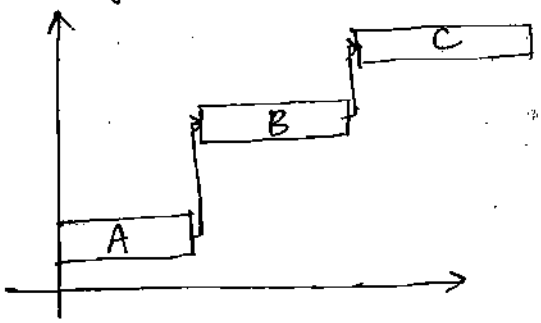
• In mile stone chart relationship between sub-activities of an activity is being shown but still interdependencies between various activities is not clear.



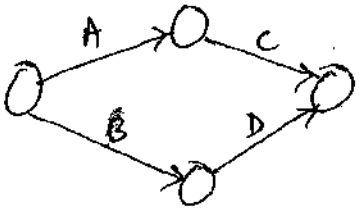
. Linked-Bar chart :-

→ It is an improvement over original bar chart & mile stone chart.

→ In Linked bar chart activities are interlinked with each other with the help of arrows, indicating their sequence of occurrance.



1. Network Diagram :-



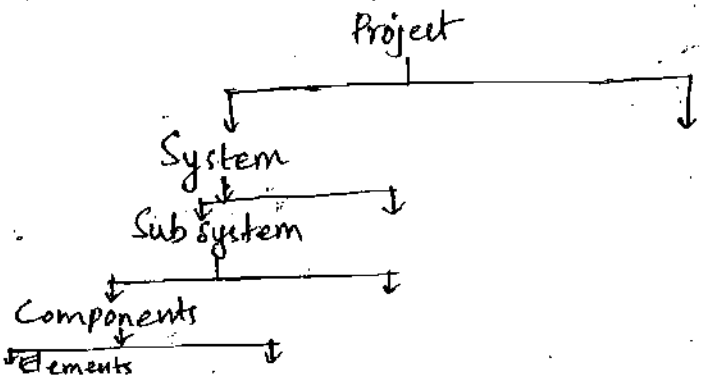
→ Network Diagram is a graphical & Logical model of sequence of activities

→ Types of Network Diagram;

i) A-O-A [Activity Over Arrow]

ii) A-O-N [Activity Over Node]

: Work Breakdown Structure (WBS) :-



→ WBS is a graphical representation of functional Elements of entire project
→ It follows "Top to Bottom Approach".
→ It is a process of breaking the complex project into system, sub system, components & elements.

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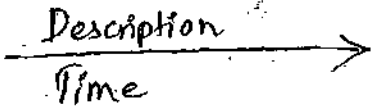
2. Fundamentals of Network

→ Network diagram is graphical & logical model of sequence of activities
→ Types of Network ;
i) A-O-A
ii) A-O-N

Note :-
→ Few people further classify A-O-A network as PERT & CPM networks, but truely speaking PERT & CPM are management techniques.
→ Basic definitions :-

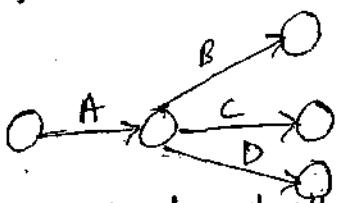
i) Activity :-
→ Activity is a task (or) job which consumes resource and time
→ Every activity has a definite starting point and an end point.
→ Activity is represented by ;



→ Length of arrow has no significance
→ Types of Activities ;
i) Serial Activities :-

→ Performed one after another.

i) Parallel Activities :-



→ These are independent of each other and can be performed simultaneously

→ These are also called as concurrent Activities

Event :-

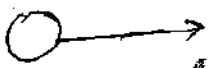
→ Event is an instant of time at which something specific is achieved in the project that is start of an Activity (or) Activities otherwise completion of an Activity (or) Activities.

→ Event neither consumes any resource nor time

→ Events are represented by ○, □, ▭, ⬭

→ Types of events ;

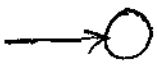
i) Tail event :-



→ It signifies start of an activity

→ If a particular tail event signifies start of the project then it is called as "Initial Event".

ii) Head event :-



→ It signifies completion of an activity

→ If a particular head event represents completion of the project then it is called as "Final/End Event".

iii) Dual Role/Interface Event :-