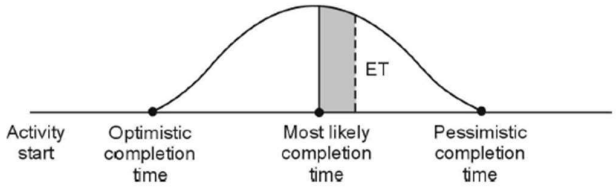
	Identify critical activities that cannot be delayed without delaying the project. Estimate the amount of slack associated with non-critical activities.

Activity	Description	Optimistic time	Most likely time	Pessimistic time
A	Develop product specifications	2	4	6
B	Design manufacturing process	3	7	10
C	Source and purchase materials	2	3	5
D	Source and purchase tooling and equipment	4	7	9
E	Receive and install tooling and equipment	12	16	20
F	Receive materials	2	5	8
G	Pilot production run	2	2	2
H	Evaluate product design	2	3	4
I	Evaluate process performance	2	3	5
J	Write documentation report	2	4	6
K	Transition to manufacturing	2	2	2

Using beta probability distribution to calculate expected time durations

- A typical beta distribution is shown below, note that it has definite end points.
- The expected time for finishing each activity is a weighted average.



$$\text{Exp. time} = \frac{\text{Optimistic} + 4(\text{most likely}) + \text{pessimistic}}{6}$$

Calculating Expected Task Times

$$\text{Exp. time} = \frac{\text{Optimistic} + 4(\text{mos likely}) + \text{pessimistic}}{6}$$

Activity	Optimistic time	Most likely time	Pessimistic time	Expected time
A	2	4	6	4
B	3	7	10	6.83
C	2	3	5	3.17
D	4	7	9	6.83
E	12	16	20	16
F	2	5	8	5
G	2	2	2	2
H	2	3	4	3
I	2	3	5	3.17
J	2	4	6	4
K	2	2	2	2

3.	**Derive critical path for completion of the project. Based on task dependency diagram allocate resource and derive Activity Chart.**

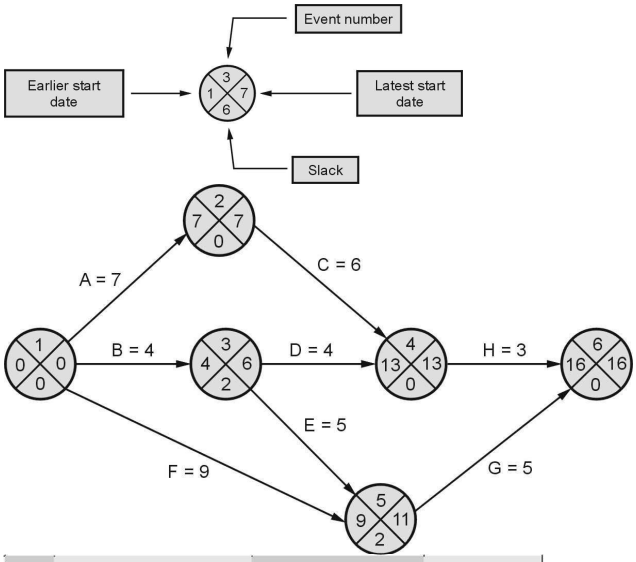
- Primary objectives :
  - Planning the project so that it can be completed as quickly as possible.
  - Identifying those activities where their delays is likely to affect the overall project completion date
- Developed by Du Pont Chemical Company and published in 1958.
- Capture the activities and their inter-relationships using a graph.
  - Lines are used to represent the activities.
  - Nodes are used to represent the start and stop of activities.
- Dummy activities (dotted lines) can be used to :
  - Avoid logical errors to paths.
  - Document related activities that can be done in parallel and have a time lag
- In CPM, each activity has a time estimate.
- Adding time dimension
  - The forward pass

1. calculate the earliest start dates of the activities
2. to calculate the project completion date

  - The backward pass

1. calculate the latest start dates for activities
2. identify the critical path from the graph

- Identifying critical path and critical event
  - **Critical event :** an event that has zero *slack*
  - **Critical path :** a path joining those critical events
- Slack : measures how late an event may be without affecting the overall target date of the project
  - slack = latest start date – earliest start date (for an event)
- Any delay of the critical events will delay the project
- There is always at least one critical path in the CPM network.



Id.	Activity Name	Duration (weeks)	Precedents
A	Hardware selection	7	
B	Software design	4	
C	Hardware Installation	6	A
D	Coding	4	B
E	Data Preparation	5	B
F	User Documentation	9	
G	User Training	5	E,F
H	System Installation	3	C,D