

**UNIT-V****OBJECT SCHEDULING:****9**

Network diagram representation – Critical path method – Time charts and resource leveling – PERT

**1. What do you mean by project?**

A project is defined as a combination on inter related activities with limited resources namely men, machines materials, money and time all of which must be executed in a defined order for its completion.

**2. What are the three main phases of project?**

- Planning, Scheduling and Control

**3. What are the two basic planning and controlling techniques in a network analysis?**

- Critical Path Method (CPM)
- Programme Evaluation and Review Technique (PERT)

**4. What are the advantages of CPM and PERT techniques?**

- It encourages a logical discipline in planning, scheduling and control of projects
- It helps to effect considerable reduction of project times and the cost
- It helps better utilization of resources like men,machines,materials and money with reference to time
- It measures the effect of delays on the project and procedural changes on the overall schedule.

**5. What is the difference CPM and PERT****CPM**

- Network is built on the basis of activity
- Deterministic nature
- One time estimation

**PERT**

- An event oriented network
- Probabilistic nature
- Three time estimation.

**6. What is network?**

A network is a graphical representation of a project's operation and is composed of all the events and activities in sequence along with their inter relationship and inter dependencies.

**7. What is Event in a network diagram?**

An event is specific instant of time which marks the starts and end of an activity. It neither consumes time nor resources. It is represented by a circle.

**8. Define activity?**

A project consists of a number of job operations which are called activities. It is the element of the project and it may be a process, material handling, procurement cycle etc.

**9. Define Critical Activities?**

In a Network diagram critical activities are those whose if consumer more than estimated time the project will be delayed.

**10. Define non critical activities?**

Activities which have a provision such that the event if they consume a specified time over and above the estimated time the project will not be delayed are termed as non critical activities.

**11. Define Dummy Activities?**

When two activities start at a same time, the head event are joined by a dotted arrow known as dummy activity which may be critical or non critical.

**12. Define duration?**

It is the estimated or the actual time required to complete a trade or an activity.

**13. Define total project time?**

It is time taken to complete to complete a project and just found from the sequence of critical activities. In other words it is the duration of the critical path.

**14. Define Critical Path?**

It is the sequence of activities which decides the total project duration. It is formed by critical activities and consumes maximum resources and time.

**15. Define float or slack? (MAY '08)**

Slack is with respect to an event and float is with respect to an activity. In other words, slack is used with PERT and float with CPM. Float or slack means extra time over and above its duration which a non-critical activity can consume without delaying the project.

**16. Define total float? (MAY '08)**

The total float for an activity is given by the total time which is available for performance of the activity, minus the duration of the activity. The total time is available for execution of the activity is given by the latest finish time of an activity minus the earliest start time for the activity. Thus

Total float = Latest start time – earliest start time.

**17. Define free float? (MAY '08)**

This is that part of the total float which does not affect the subsequent activities. This is the float which is obtained when all the activities are started at the earliest.

**18. Define Independent float? (MAY '07) (MAY '08)**

If all the preceding activities are completed at their latest, in some cases, no float available for the subsequent activities which may therefore become critical.

Independent float = free – tail slack.

**19. Define Interfering float?**

Sometimes float of an activity if utilized wholly or in part, may influence the starting time of the succeeding activities is known as interfering float.

Interfering float = latest event time of the head - earliest event time of the event.

**20. Define Optimistic?**

Optimistic time estimate is the duration of any activity when everything goes on very well during the project.

**21. Define Pessimistic?**

Pessimistic time estimate is the duration of any activity when almost everything goes against our will and a lot of difficulties is faced while doing a project.

**22. Define most likely time estimation?**

Most likely time estimate is the duration of any activity when sometimes things go on very well, sometimes things go on very bad while doing the project.

**24. What is a parallel critical path?**

When critical activities are crashed and the duration is reduced other paths may also become critical such critical paths are called parallel critical path.

**25. What is standard deviation and variance in PERT network? (NOV '07)**

The expected time of an activity in actual execution is not completely reliable and is likely to vary. If the variability is known we can measure the reliability of the expected time as determined from three estimates. The measure of the variability of possible activity time is given by standard deviation, their probability distribution

Variance of the activity is the square of the standard deviation

**26. Give the difference between direct cost and indirect cost? (NOV '07)**

Direct cost is directly depending upon the amount of resources involved in the execution of all activities of the project. Increase in direct cost will decrease in project duration. Indirect cost is associated with general and administrative expenses, insurance cost, taxes etc. Increase in indirect cost will increase in project duration.

**PART-B**

1. A project schedule has the following characteristics

Activity	0 - 1	0 - 2	1 - 3	2 - 3	2 - 4	3 - 4	3 - 5	4 - 5	4 - 6	5 - 6
Time	2	3	2	3	3	0	8	7	8	6

- (i). Construct Network diagram.
- (ii). Compute Earliest time and latest time for each event.
- (iii). Find the critical path. Also obtain the Total float, Free float and slack time and Independent float.

2.A project schedule has the following characteristics.

Activity	1 – 2	1 – 3	2 – 4	3 – 4	3 – 5	4 – 9	5 – 6	5 – 7	6 – 8	7 – 8	8 – 10	9 – 10
Time	4	1	1	1	6	5	4	8	1	2	5	7

- (i). Construct Network diagram
- (ii). Compute Earliest time and latest time for each event.
- (iii). Find the critical path. Also obtain the Total float, Free float and slack time and Independent float.

3.A small project is composed of seven activities whose time estimates are listed in the table as follows:

Activity	Preceding Activities	Duration
A	----	4
B	----	7
C	----	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

- (I). Draw the network and find the project completion time.
- (ii). Calculate the three floats for each activity.

4.Calculate the total float, free float and independent float for the project whose activities are given below:

Activity	1 – 2	1 – 3	1 – 5	2 – 3	2 – 4	3 – 4	3 – 5	3 – 6	4 – 6	5 – 6
Key	8	7	12	4	10	3	5	10	7	4

Find the critical path also.

5.Draw the network for the following project and compute the earliest and latest times for each event and also find the critical path.

Activity	1 – 2	1 – 3	2 – 4	3 – 4	4 – 5	4 – 6	5 – 7	6 – 7	7 – 8
Immediate Predecessor	---	---	1 – 2	1 – 3	2 – 4	2 – 4 & 3 – 4	4 – 5	4 – 6	6 – 7 & 5 – 7
Time	5	4	6	2	1	7	8	4	

6. The following table lists the jobs of a network with their time estimates:

Job(I, j)	Duration		
	Optimistic (to)	Most likely(tm)	Pessimistic (tp)
1 – 2	3	6	15
1 – 6	2	5	14
2 – 3	6	12	30
2 – 4	2	5	8
3 – 5	5	11	17
4 – 5	3	6	15
6 – 7	3	9	27
5 – 8	1	4	7
7 – 8	4	19	28

- (i). Draw the project network.
- (ii). Calculate the length and variance of the Critical Path.
- (iii). What is the approximate probability that the jobs on the critical path will be completed by the due date of 42 days?
- (iv). What due date has about 90 % chance of being met?

7. A small project is composed of 7 activities, whose time estimates are listed in the table below. Activities are identified by their beginning (i) and (j) node numbers.

Job(I, j)	Duration		
	Optimistic (to)	Most likely(tm)	Pessimistic (tp)
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15

- (i). Draw the project network and identify all the paths through it.
- (ii). Find the expected duration and variance for each activity. What is the expected project length?
- (iii). Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed atleast 4 weeks earlier than expected time?

8. The following table lists the jobs of a network along with their time estimates.

Activity	1 – 2	1 – 3	2 – 4	3 – 4	3 – 5	4 – 9	5 – 6	5 – 7	6 – 8	7 – 8	8 – 10	9 – 10
Time	4	1	1	1	6	5	4	8	1	2	5	7

- Draw the project network.
- Calculate the length and variance of the critical path after estimating the earliest and latest event times for all nodes.
- Find the probability of completing the project before 41 days?

9. The time estimates (in weeks) for the activities of a PERT network are given below:

Job(I, j)	Duration		
	Optimistic (to)	Most likely (tm)	Pessimistic (tp)
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15

- Determine the expected project length.
- Calculate the standard deviation and variance of the project.
- If the project due date is 19 weeks, what is the probability of not meeting the due date?

10. The following table lists the jobs of a network along with their time estimates

Job(I, j)	Duration		
	Optimistic (to)	Most likely (tm)	Pessimistic (tp)
1 – 2	2	5	14
1 – 3	9	12	15
2 – 4	5	14	17
3 – 4	2	5	8
4 – 5	6	6	12
3 – 5	8	17	20

Draw the network. Calculate the length and variance of the critical path and find the probability that the project will be completed within 30 days.