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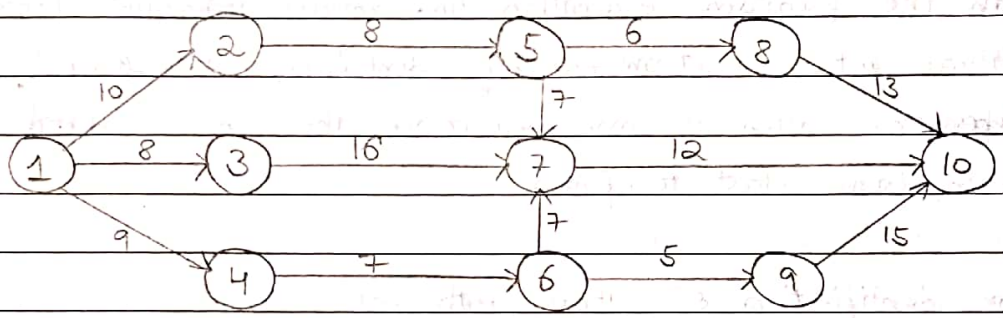
Saathi Notebooks (1)

Assignment - C2

* Title :- Critical Path Method

* Problem statement :- Determine the early start and late start in respect of all node points and identify critical path for the following network. Also, draw the Network Analysis table.



* Prerequisites :-
  - Project Management.
  - Discrete mathematics

* Software Requirements :-
  - Google Colab / Jupyter Notebook.
  - Python 3.7.

* Hardware Requirements
  - 64-bit windows machine

* Learning Objectives
  - To introduce students to project scheduling techniques.
  - To introduce students to key steps in critical method.

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Saathi Notebooks (2)

* Learning Outcomes:-
- Students will understand & implement critical path method in project management.
- Students will be able to identify critical nodes and draw Network Analysis Table.

* Theory:- The critical path method is an algorithm for scheduling a set of project activities. It is commonly used in conjunction with the program evaluation and review technique (PERT). A critical path is determined by identifying the longest stretch of dependent activities and measuring the time required to complete them from start to finish.

For identification of critical path method:-

⇒ Earliest start time (ES):- The earliest time an activity can start once the previous dependent activities are over.

⇒ Earliest Finish time (EF):- ES + Activity duration.

⇒ Latest Finish time (LF):- The latest time that an activity can finish without delaying the project.

⇒ Latest Start Time (LS):-
LF = Activity duration.

The critical path is the longest path of the network diagram. The activities in the critical path have an effect on the deadline of the project. If an activity of this path is delayed, the project will be delayed.

If the project management needs to accelerate the project, the times for critical path activities should be reduced.

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* Advantages of CPM :-

⇒ Offers a visual representation of the project activities.
⇒ Tracking of critical activities.
⇒ Presents the time to complete the tasks and the overall project.

Network Analysis Table :-

Activity	Duration	ES	LS	EF	LF	Float	isCritical
1-2	10	0	0	10	10	0	True
1-3	8	0	1	8	9	1	-
1-4	9	0	1	9	10	1	-
2-5	8	10	10	18	18	0	True
3-7	16	8	9	24	25	1	-
4-6	7	9	10	16	17	1	-
5-7	7	18	18	25	25	0	True
5-8	6	18	18	24	24	0	True
6-7	7	16	18	23	25	2	-
6-9	5	16	17	21	22	1	-
7-10	12	25	25	37	37	0	True
8-10	13	24	24	37	37	0	True.
9-10.	15	21	22	36	37	1	-

When ES = LS and EF = LF.

1 → 2 2 → 5 5 → 7
5 → 8 7 → 10 8 → 10.

∴ Critical Nodes are :-

(1,2), (2,5), (5,7), (5,8), (7,10), (8,10).

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Saathi Notebooks (4)

Critical Paths :-

(i) $1 \rightarrow 2 \rightarrow 5 \rightarrow 7 \rightarrow 10$.

or

(ii) $1 \rightarrow 2 \rightarrow 5 \rightarrow 8 \rightarrow 10$.

Total time = 37.

* Conclusion :-

Hence, we have successfully identified the critical path from the given network along with the early and late starts.

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