# SPM: SOFTWARE PROJECT MANAGEMENT

# TOPIC On : CPM-CRITICAL PATH METHOD

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Under On: SOFTWARE PROJECT MANAGEMENT

# TOPIC On : CPM- CRITICAL PATH METHOD

# Problem of Critical Path Method (CPM)

Determine the critical path, the critical activities and the project completion time

**Problem 1**

The following details are available regarding a project:

| Activity | Predecessor Activity | Duration (Weeks) |
|----------|---------------------|------------------|
| A | - | 3 |
| B | A | 5 |
| C | A | 7 |
| D | B | 10 |
| E | C | 5 |
| F | D,E | 4 |

Determine the critical path, the critical activities and the project completion time.
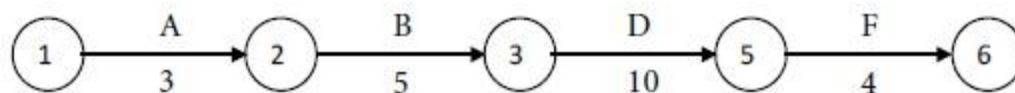
**Solution**

First let us construct the network diagram for the given project. We mark the time estimates along the arrows representing the activities. We obtain the following diagram:
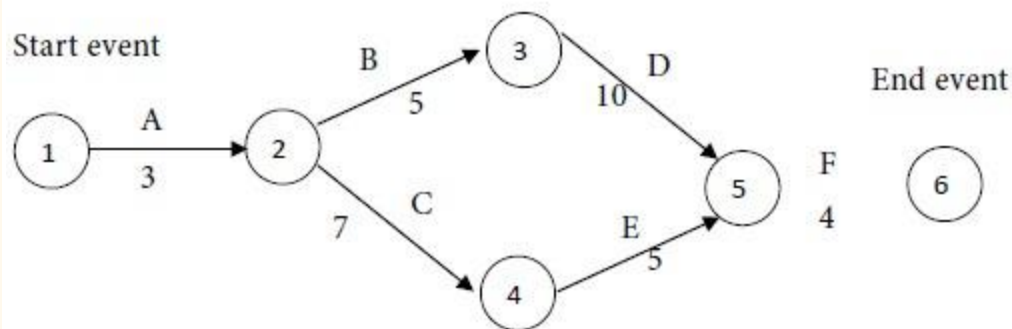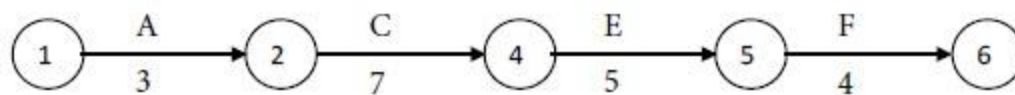
Consider the paths, beginning with the start node and stopping with the end node. There are two such paths for the given project. They are as follows:

**Path I**



with a time of $3 + 5 + 10 + 4 = 22$ weeks.

**Path II**



with a time of $3 + 7 + 5 + 4 = 19$ weeks.

Compare the times for the two paths. Maximum of $\{22,19\} = 22$. We see that path I has the maximum time of 22 weeks. Therefore, path I is the critical path. The critical activities are A, B, D and F. The project completion time is 22 weeks.
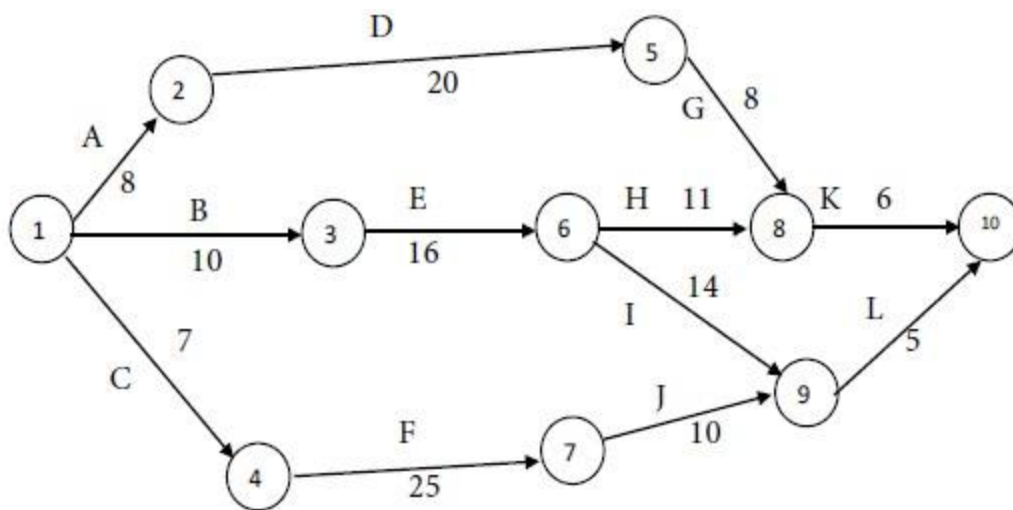
We notice that C and E are non- critical activities.

Time for path I - Time for path II $= 22 - 19 = 3$ weeks.

Therefore, together the non- critical activities can be delayed upto a maximum of 3 weeks, without delaying the completion of the whole project.
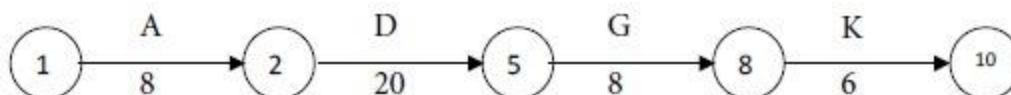
**Problem 2**

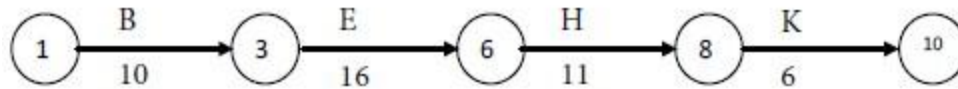Find out the completion time and the critical activities for the following project:



**Solution**

In all, we identify 4 paths, beginning with the start node of 1 and terminating at the end node of 10. They are as follows:
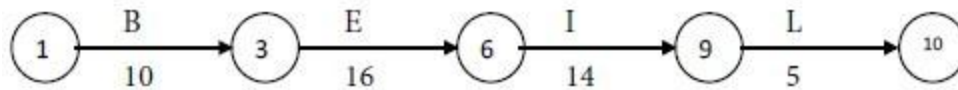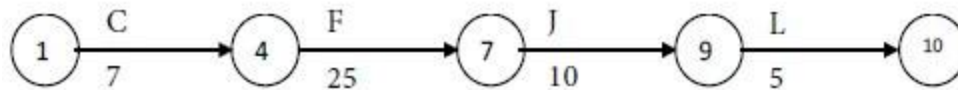
**Path I**



Time for the path = 8 + 20 + 8 + 6 = 42 units of time.

## Path II



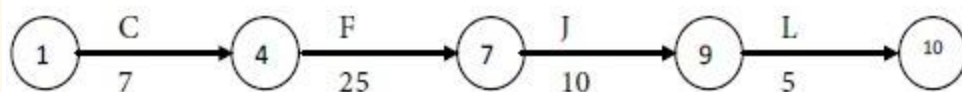Time for the path = 10 + 16 + 11 + 6 = 43 units of time.

## Path III



Time for the path = 10 + 16 + 14 + 5 = 45 units of time.

## Path IV



Time for the path = 7 + 25 + 10 + 5 = 47 units of time.

Compare the times for the four paths. Maximum of {42, 43, 45, 47} = 47. We see that the following path has the maximum time and so it is the critical path:

The critical activities are C, F, J and L. The non-critical activities are A, B, D, E, G, H, I and K. The project completion time is 47 units of time.
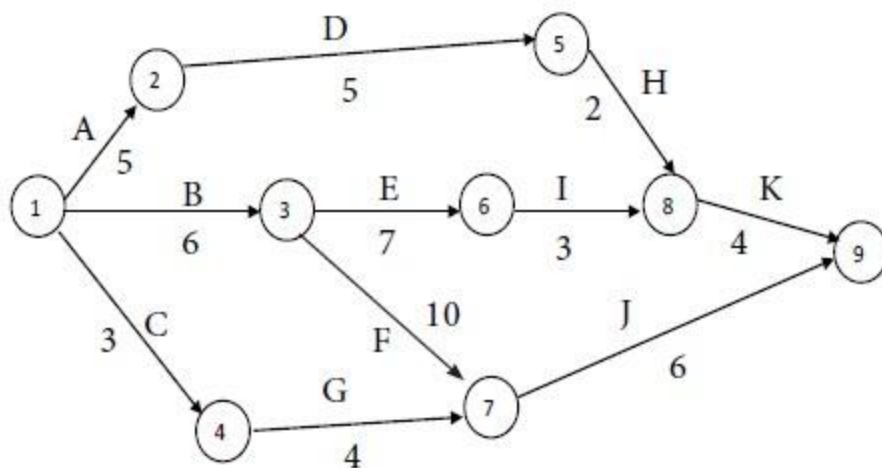
**Problem 3**

Draw the network diagram and determine the critical path for the following project:

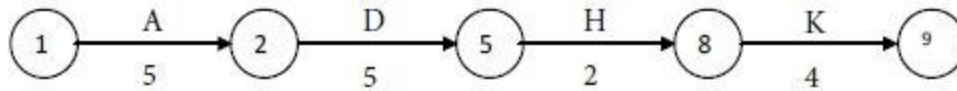| Activity | Time estimate (Weeks) |
|----------|----------------------|
| 1- 2 | 5 |
| 1- 3 | 6 |
| 1- 4 | 3 |
| 2 -5 | 5 |
| 3 -6 | 7 |
| 3 -7 | 10 |
| 4 -7 | 4 |
| 5 -8 | 2 |
| 6 -8 | 5 |
| 7 -9 | 6 |
| 8 -9 | 4 |

**Solution**
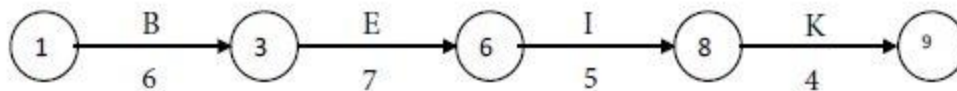
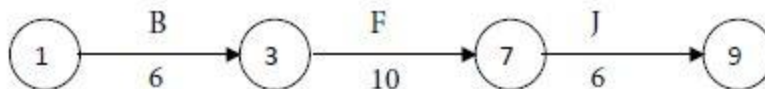We have the following network diagram for the project:

**Solution**

We assert that there are 4 paths, beginning with the start node of 1 and terminating at the end node of 9. They are as follows:
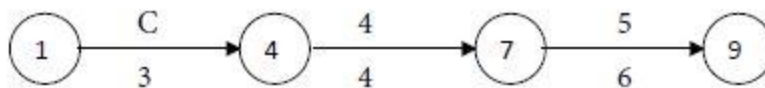
**Path I**



Time for the path = 5 + 5 + 2 + 4 = 16 weeks.

**Path II**



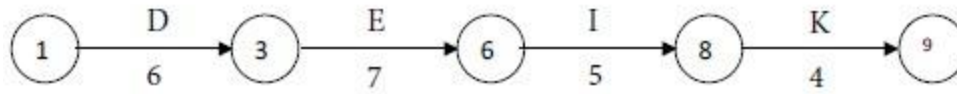Time for the path = 6 + 7 + 5 + 4 = 22 weeks.

**Path III**



Time for the path = 6 + 10 + 6 = 16 weeks.

**Path IV**



Time for the path = 3 + 4 + 6 = 13 weeks.

Compare the times for the four paths. Maximum of {16, 22, 16, 13} = 22. We see that the following path has the maximum time and so it is the critical path:

```
      D            E            I            K
(1)--------->(3)--------->(6)--------->(8)--------->(9)
      6            7            5            4
```

The critical activities are B, E, I and K. The non-critical activities are A, C, D, F, G, H and J. The project completion time is 22 weeks.