# Float Calculations

There are four types of floats.

1. Total float
2. Free float
3. Independent float
4. Interfering float

Network માંથી આપણે E અને L પ્રત્યેક node માટે calculate કરવાનો છે.

> E - Earliest occurance time and
> L - latest occurance time થાય છે.

1) For an activity i-j

- $E_{sij} = E_i$

$E_{sij}$ / $E_i$ - Earliest starting time of activity i-j or
- Earliest expected completion time of tail event i.e. i

$E_{fij}$ - Earliest finish time of activity i-j

$$E_{fij} = E_{sij} + t_{ij}$$

$$E_{fij} = E_i + t_{ij}$$

- $L_{fij} = L_j$

$L_{fij}$ / $L_j$ - Latest finish time of activity (i-j) or
- Later expected completion time of head event i.e. j

$$L_{sij} = L_{fij} - t_{ij}$$

$$= (L_j - t_{ij})$$

(i) Total float-

It is the amount of time by which completion of an activity could be delayed beyond the earliest expected completion time without affecting the overall project duration time.

Thus the total float of an activity is the difference of its latest start and earliest start times or the difference of its latest finish and earliest finish times

$$\text{Total float}_{(ij)} = L_{si_j} - E_{si_j}$$

$$= L_{fi_j} - t_{ij} - E_{si_j}$$

$$= L_j - t_{ij} - E_i$$

$$\boxed{\text{Total float}_{(ij)} = (L_j - E_i) - t_{ij}}$$

or

$$\text{Total float}_{(ij)} = L_{fij} - E_{fij}$$

$$= L_{ij} - (E_{si_j} + t_{ij})$$

$$= L_{fi_j} - E_{si_j} - t_{ij}$$

$$\boxed{\text{Total float}_{ij} = (L_j - E_i) - t_{ij}}$$

(ii) Free float-

It is that portion of the total float within which an activity can be manipulated without affecting the floats of subsequent activities. It is computed by subtracting the head event slack from total float. The head event slack is (l-f) of the event.

$$F_{Fij} = T_{Fij} - (L-E) \text{ of event } j$$

$$\text{Free float}(i-j) = \text{Total float}(i-j) - (L-E) \text{ of event } j$$

Thus, free float is the time by which completion of an activity can be delayed without delaying its immediate activities.

(iii) Independent float-

It is that portion of the total float within which an activity can be delayed for start without affecting the floats of preceding activities.

It is computed by subtracting the tail event slack from free float.

If the result is negative, it is taken as zero.

$$\text{Independent float}(ij) = \text{Free float}_{(i-j)} - (L-E) \text{ of tail event } i$$

$$\text{Independent float}(i-j) = F_{Fij} - (L-E) \text{ of tail event } i$$

(iv) Interfering float-

Utilization of the float of an activity can affect the floats of the subsequent activities in the network.

Thus, interfering float can be defined as that part of the total float which causes a reduction in the floats of the succeeding activities.

It is that portion of the activity float

which cannot be consumed without adversely affecting the floats of the subsequent activities.

It is numerically equal to the difference between the total float and the free float of the activity. It is also equal to the head event slack of the activity.

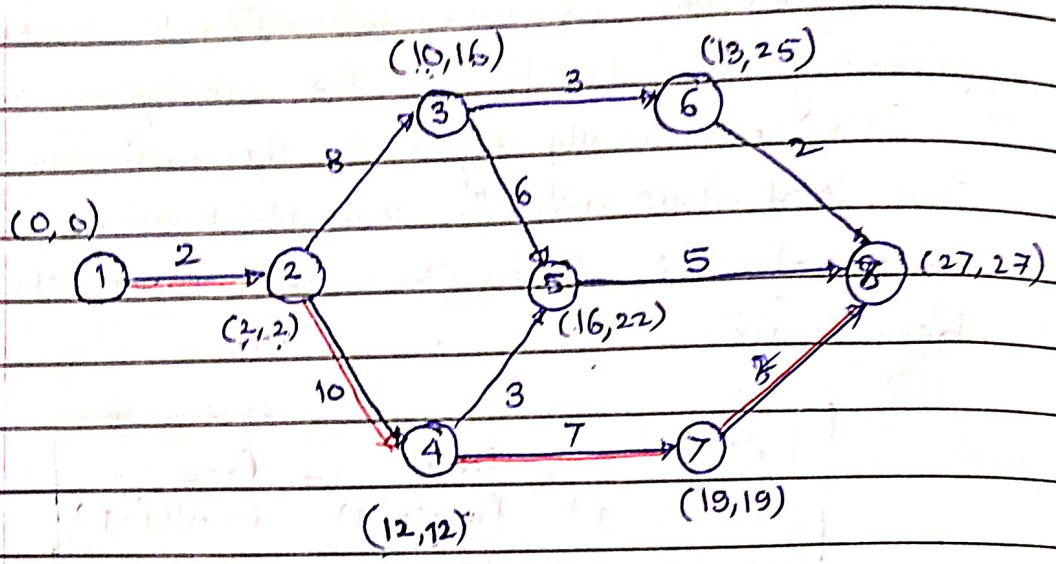
$$\text{Interfering float}(i\text{-}j) = \text{Total float}(i\text{-}j) - \text{free float}(i\text{-}j)$$

or

$$\text{Interfering float}(i\text{-}j) = (L\text{-}E) \text{ of the head event of the activity}$$

**Ex 1** The data for the network is given below. Determine total, free, independent and interfering floats.

| Activity (i-j) | duration ($t_{ij}$) | Activity (i-j) | duration ($t_{ij}$) |
|---|---|---|---|
| 1 - 2 | 2 | 4 - 5 | 3 |
| 2 - 3 | 8 | 4 - 7 | 7 |
| 2 - 4 | 10 | 5 - 8 | 5 |
| 3 - 5 | 6 | 6 - 8 | 2 |
| 3 - 6 | 3 | 7 - 8 | 8 |
| | | | |




Critical Path — 1-2-4-7-8

| Activity (i-j) | dur. (tij) | Earliest- Start- Esij | Earliest- finish. Efij | Latest- Start- Lsij | Latest- finish Lfij | Total float- | free float | Independent float | Interfering float- |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1-2 | 2 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 |
| 2-3 | 8 | 2 | 10 | 8 | 16 | 6 | 0 | 0 | 6 |
| 2-4 | 10 | 2 | 12 | 2 | 12 | 0 | 0 | 0 | 0 |
| 3-5 | 6 | 10 | 16 | 16 | 22 | 6 | 0 | -6 ≐ 0 | 6 |
| 3-6 | 3 | 10 | 13 | 22 | 25 | 12 | 0 | -6 ≐ 0 | 12 |
| 4-5 | 3 | 12 | 15 | 19 | 22 | 7 | 1 | 1 | 6 |
| 4-7 | 7 | 12 | 19 | 12 | 19 | 0 | 0 | 0 | 0 |
| 5-8 | 5 | 16 | 21 | 22 | 27 | 6 | 6 | 0 | 0 |
| 6-8 | 2 | 13 | 15 | 25 | 27 | 12 | 12 | 0 | 0 |
| 7-8 | 8 | 19 | 27 | 19 | 27 | 0 | 0 | 0 | 0 |

Total float-

Sub either start times (5-3) or finish times (6-4)

i.e. (Lsij - Esij) or (Lfij - Efij)

## Free float-

$F_{Fij} = T_{Fij} - (L-E)$ of event $j$.

1-2 = 0 - (2-2) = 0

2-3 = 6 - (16-10) = 0

2-4 = 0 - (12-12) = 0

3-5 = 6 - (22-16) = 0

3-6 = 12 - (25-13) = 0

4-5 = 7 - (22-16) = 1

4-7 = 0 - (19-19) = 0

5-8 = 6 - (27-27) = 6

6-8 = 12 - (27-27) = 12

7-8 = 0 - (27-27) = 0

## Independent float-

$I_{Fij} = f_{Fij} - (L-E)$ of event $i$

1-2 = 0 - (0-0) = 0

2-3 = 0 - (2-2) = 0

2-4 = 0 - (2-2) = 0

3-5 = 0 - (16-10) = -6 = 0

3-6 = 0 - (16-10) = -6 = 0

4-5 = 1 - (12-12) = 1

4-7 = 0 - (19-19) = 0

5-8 = 6 - (27-27) = 0

6-8 = 12 - (25-13) = 0

7-8 = 0 - (19-19) = 0

## Interfering float- = Total float - Free float -

or (L-E) of the head event of the activity