

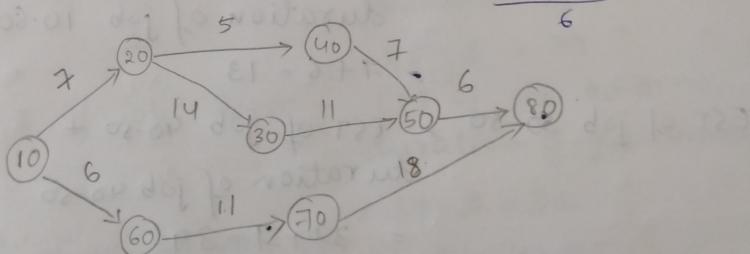
Jobs	10-20	10-60	20-30	30-40	30-50	40-50	60-70	50-80	70-80
$T_o$	1	2	2	7	5	5	3	8	
$T_m$	7	5	14	5	10	5	8	3	17
$T_p$	13	14	26	8	19	17	29	9	32

a) Project network diagram:-

Before going to draw the network diagram we have to calculate the expected or average time ( $t_e$ ) for each activity.

$$T_e = \frac{t_o + 4t_m + t_p}{6} \quad \sigma = \frac{t_p - t_o}{6}$$

Jobs	$t_o$	$t_m$	$t_p$	$T_e$	$\sigma$
10-20	1	7	13	$\frac{1+4(7)+13}{6} = 7$	2
10-60	2	5	14	$\frac{2+4(5)+14}{6} = 6$	2
20-30	2	14	26	$\frac{2+4(14)+26}{6} = 14$	4
20-40	2	5	8	$\frac{2+4(5)+8}{6} = 5$	1
30-50	7	10	19	$\frac{7+4(10)+19}{6} = 11$	2
40-50	5	5	17	$\frac{5+4(5)+17}{6} = 7$	2
60-70	5	8	29	$\frac{5+4(8)+29}{6} = 11$	4
50-80	3	3	9	$\frac{3+4(3)+9}{6} = 6$	1
70-80	8	17	32	$\frac{8+4(17)+32}{6} = 18$	4



### EST calculation:-

EST is calculated by starting from event-1 activity (Job) 10-20 and giving it a time 'o'

$$\text{EST of Job } 10-60 = \text{EST of Job } 10-20 + \text{duration of Job } 10-20$$

$$= 0 + 7 = 7$$

$$\text{EST of Job } 20-30 = \text{EST of Job } 10-60 + \text{duration of Job } 10-60$$

$$= 7 + 6 = 13$$

$$\text{EST of Job } 20-40 = \text{EST of Job } 20-30 + \text{duration of Job } 20-30$$

$$= 13 + 14 = 27$$

$$\text{EST of Job } 30-50 = \text{EST of Job } 20-30 + \text{duration of Job } 20-30$$

$$= 27 + 14 = 41$$

$$\text{EST of Job } 40-50 = \text{EST of Job } 20-40 + \text{duration of Job } 20-40$$

$$= 27 + 5 = 32$$

$$\text{EST of Job } 50-70 = \text{EST of Job } 10-60 + \text{duration of Job } 10-60$$

$$= 7 + 6 = 13$$

$$\text{EST of Job } 50-80 = \text{EST of Job } 40-50 + \text{duration of Job } 40-50$$

$$= 32 + 7 = 39$$

i) LFT

LF

LFT

LFT

LFT

LFT

LFT

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LFT

$$EST \text{ of job } 70-80 = EST \text{ of job } 50-80 + \text{duration}$$

of job 50-80

$$\Rightarrow 39 + 6 = 45$$

FS  
(or)

$$EST \text{ of job } 60-70 + \text{duration}$$

of job 60-70

$$\Rightarrow 13 + 11 = 24$$

EST should be high,

$$\text{so, EST of job } 70-80 = 45.$$

$$EST \text{ of job close} = EST \text{ of activity } 70-80 +$$

duration of 70-80

$$= 45 + 18 = 63.$$

### ii) LFT calculation :-

$$LFT \text{ of job } 70-80 = 63$$

$$LFT \text{ of job } 50-80 = LFT \text{ of job } 70-80 -$$

duration of job 70-80

$$= 63 - 18 = 45$$

$$LFT \text{ of job } 60-70 = LFT \text{ of job } 70-80 -$$

duration of job 70-80

$$= 45$$

$$LFT \text{ of job } 40-50 = LFT \text{ of job } 50-80 -$$

duration of job 50-80

$$= 45 - 6 = 39$$

$$LFT \text{ of job } 30-50 = LFT \text{ of job } 40-50 -$$

duration of job 40-50

$$= 39 - 7 = 32$$

$$LFT \text{ of job } 20-40 = LFT \text{ of job } 40-50 -$$

duration of job 40-50 = 32

$$\text{LFT of job } 20-30 = \text{LFT of job } 20-40 - \text{duration of job } 20-40 \\ = 32 - 5 = 27$$

$$\text{LFT of job } 10-60 = \text{LFT of job } 60-70 - \text{duration of job } 60-70 \\ = 45 - 11 = 34$$

$$\text{LFT of job } 10-20 = \text{LFT of job } 20-40 - \text{LFT of job } 20-40$$

$$= 32 - 5 = 27$$

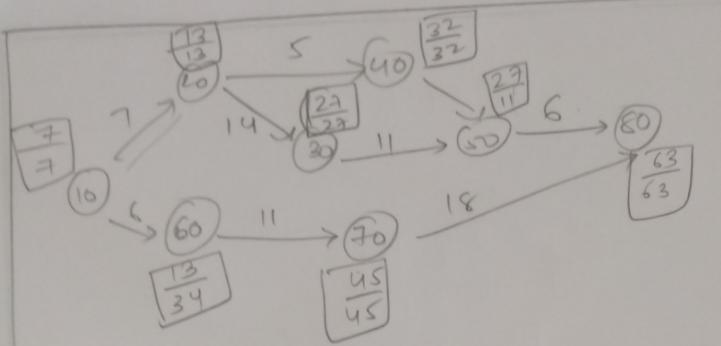
(cor)

$$\text{LFT of job } 20-30 - \text{duration} \\ \text{of job } 20-30 \\ = 27 - 14 = 13$$

LFT should be less

$$\text{So, LFT of job } 10-20 = 13 - \text{duration}$$

Job	Duration	EST	LST	EFT	LFT
10-20	7	7	13	13	27
10-60	6	6	28	28	34
20-30	14	13	13	27	27
20-40	5	27	27	32	32
30-50	11	27	21	38	32
40-50	27	32	32	39	39
60-70	11	13	34	24	45
50-80	6	39	39	45	45
70-80	18	45	45	63	63



critical path  $10 \rightarrow 20 \rightarrow 20-40 \rightarrow 40-50 \rightarrow 50-80$

$$\text{probability} = P\left(\frac{x-\mu}{\sigma}\right)$$

$$x=40 \quad \mu = 7 + 13 + 32 + 63 \quad \sigma = \frac{tp - t_o}{6} \\ = 115/9 = 12.77 \quad = 22$$

$$z = \left( \frac{40 - 12.77}{22} \right) = \frac{27.23}{22} = 1.23$$