IIT ROORKEE

NPTEL ONLINE CERTIFICATION COURSE

Project Management for Managers

Lec – 44

Simulation of Networks- II

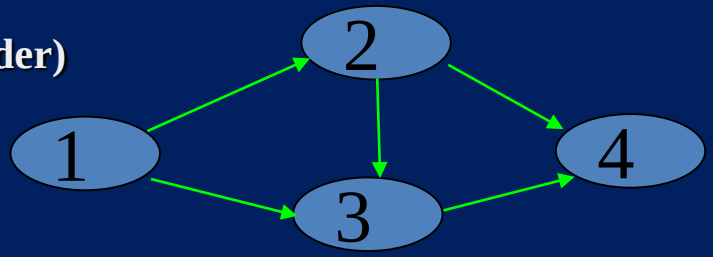
Dr. M.K. Barua

Department of Management

Indian Institute of Technology Roorkee

A PERT network consists of five activities (1,2),(1,3),(2,3),(2,4) and (3,4) with following details.

Activity	Description	RN(to be used in order)
1-2	Constant with duration 5	
1-3	Constant with duration 2	
2-3	3/.3 4/.4 5/.3	.2, .1, .9, .3, .2
2-4	6/.3 7/.5 8/.2	.9, .0, .1, .5, .6
3-4	3/.2 4/.7 5/.1	.6, .2, .9, .1, .1



Simulate the network for five times and find

(a) Distribution of T the project duration,

(b) E (T) ,

(c) P(T ≤ 14) and

(d) Critical indexes of all the activities.

First of all we find the relations connecting Tij to random numbers.

For T23 : 3/.3 4/.4 5/.3

$0 \leq u < .3$	corresponds to T23 = 3
$.3 \leq u < .7$	corresponds to T23 = 4
$.7 \leq u < 1$	corresponds to T23 = 5

Similarly,

For T24: 6/.3 7/.5 8/.2

$0 \leq u < .3$	corresponds to T24 = 6
$.3 \leq u < .8$	corresponds to T24 = 7
$.8 \leq u < 1$	corresponds to T24 = 8

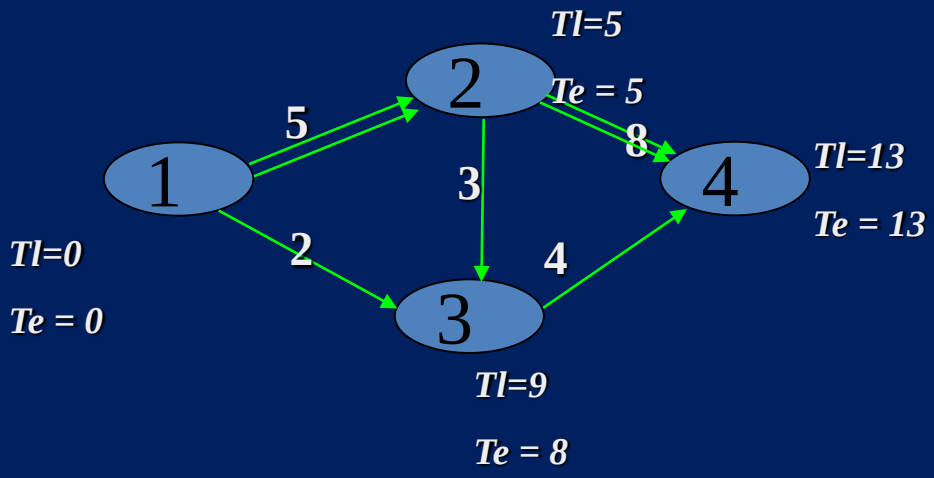
and

For T34: 3/.2 4/.7 5/.1

$0 \leq u < .2$	corresponds to T34 = 3
$.2 \leq u < .9$	corresponds to T34 = 4
$.9 \leq u < 1$	corresponds to T34 = 5

Activity	Description			RN(to be used in order)				
1-2	Constant with duration 5							
1-3	Constant with duration 2							
2-3	3/.3	4/.4	5/.3	.2,	.1,	.9,	.3,	.2
2-4	6/.3	7/.5	8/.2	.9,	.0,	.1,	.5,	.6
3-4	3/.2	4/.7	5/.1	.6,	.2,	.9,	.1,	.1

1st Simulation: T12 = 5, T13= 2, first random number for T23 is .2, the duration would be 3 days, similarly for T24 and T34 the durations would be 8 and 4 days.



$0 \le u < .3$	corresponds to T23 = 3
$.3 \le u < .7$	corresponds to T23 = 4
$.7 \le u < 1$	corresponds to T23 = 5

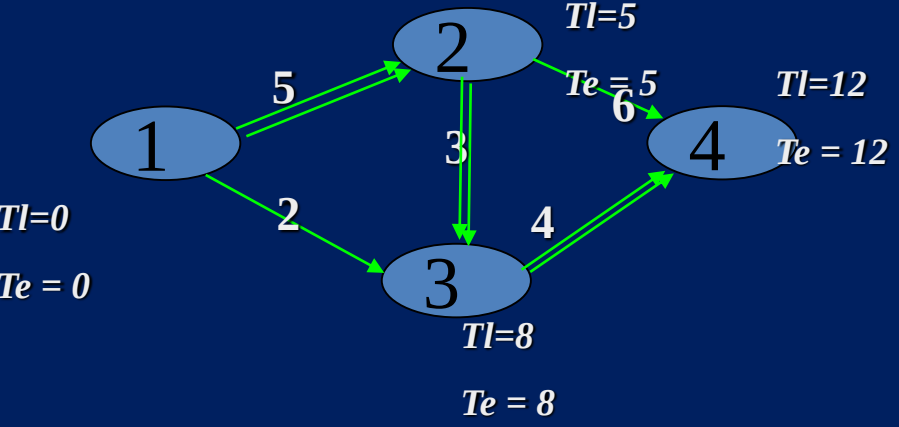
$0 \le u < .3$	corresponds to T24 = 6
$.3 \le u < .8$	corresponds to T24 = 7
$.8 \le u < 1$	corresponds to T24 = 8

$0 \le u < .2$	corresponds to T34 = 3
$.2 \le u < .9$	corresponds to T34 = 4
$.9 \le u < 1$	corresponds to T34 = 5

The critical path is 1-2-4 and the duration is 13.

Activity	Description	RN(to be used in order)
1-2	Constant with duration 5	
1-3	Constant with duration 2	
2-3	3/.3 4/.4 5/.3	.2, .1, .9, .3, .2
2-4	6/.3 7/.5 8/.2	.9, .0, .1, .5, .6
3-4	3/.2 4/.7 5/.1	.6, .2, .9, .1, .1

2nd Simulation: T12 = 5, T13= 2, second random number for T23 is .1, the duration would be 3 days, similarly for T24 and T34 the durations would be 6 and 3 days.

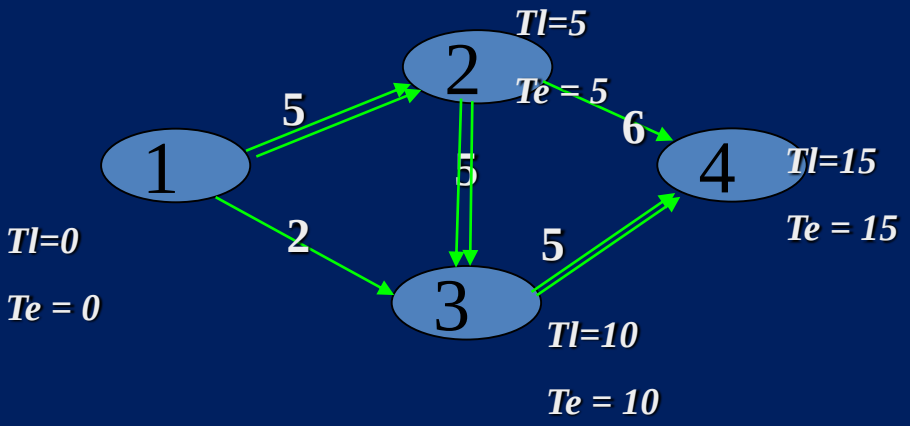


The critical path is 1-2-3-4 and the duration is 12.

$0 \le u < .3$	corresponds to T23 = 3
$.3 \le u < .7$	corresponds to T23 = 4
$.7 \le u < 1$	corresponds to T23 = 5
$0 \le u < .3$	corresponds to T24 = 6
$.3 \le u < .8$	corresponds to T24 = 7
$.8 \le u < 1$	corresponds to T24 = 8
$0 \le u < .2$	corresponds to T34 = 3
$.2 \le u < .9$	corresponds to T34 = 4
$.9 \le u < 1$	corresponds to T34 = 5

Activity	Description	RN(to be used in order)
1-2	Constant with duration 5	
1-3	Constant with duration 2	
2-3	3/.3 4/.4 5/.3	.2, .1, .9, .3, .2
2-4	6/.3 7/.5 8/.2	.9, .0, .1, .5, .6
3-4	3/.2 4/.7 5/.1	.6, .2, .9, .1, .1

3rd Simulation: T12 = 5, T13= 2, third random number for T23 is .9, the duration would be 5 days, similarly for T24 and T34 the durations would be 6 and 5 days.



The critical path is 1-2-3-4 and the duration is 15.

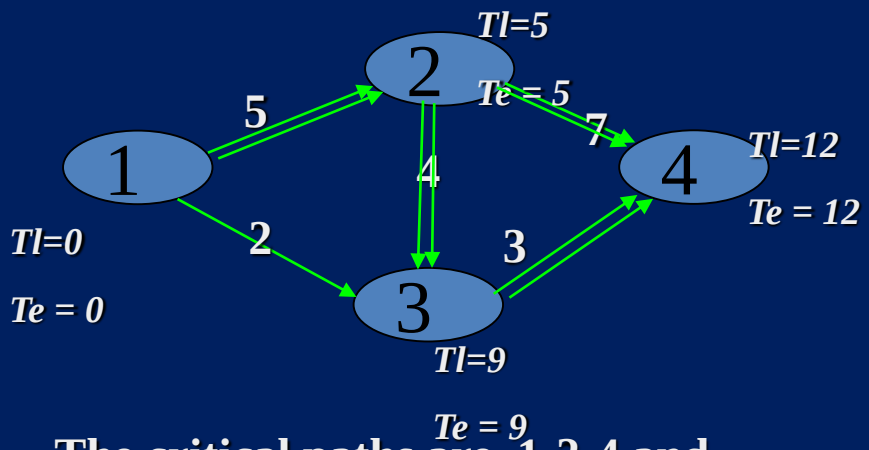
$0 \le u < .3$	corresponds to T23 = 3
$.3 \le u < .7$	corresponds to T23 = 4
$.7 \le u < 1$	corresponds to T23 = 5

$0 \le u < .3$	corresponds to T24 = 6
$.3 \le u < .8$	corresponds to T24 = 7
$.8 \le u < 1$	corresponds to T24 = 8

$0 \le u < .2$	corresponds to T34 = 3
$.2 \le u < .9$	corresponds to T34 = 4
$.9 \le u < 1$	corresponds to T34 = 5

Activity	Description	RN(to be used in order)
1-2	Constant with duration 5	
1-3	Constant with duration 2	
2-3	3/.3 4/.4 5/.3	.2, .1, .9, .3, .2
2-4	6/.3 7/.5 8/.2	.9, .0, .1, .5, .6
3-4	3/.2 4/.7 5/.1	.6, .2, .9, .1, .1

4th Simulation: T12 = 5, T13= 2, fourth random number for T23 is .3, the duration would be 4 days, similarly for T24 and T34 the durations would be 7 and 3 days.



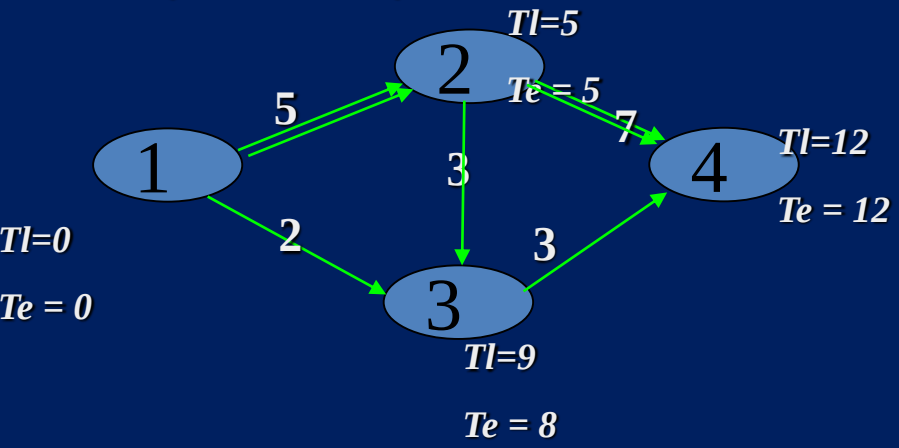
0 ≤ u < .3	corresponds to T23 = 3
.3 ≤ u < .7	corresponds to T23 = 4
.7< u < 1	corresponds to T23 = 5
0 ≤ u < .3	corresponds to T24 = 6
.3 ≤ u < .8	corresponds to T24 = 7
.8≤ u < 1	corresponds to T24 = 8
0 ≤ u < .2	corresponds to T34 = 3
.2 ≤ u <.9	corresponds to T34 = 4
.9≤ u < 1	corresponds to T34 = 5

The critical paths are 1-2-4 and

1-2-3-4 the duration is 12.

Activity	Description	RN(to be used in order)
1-2	Constant with duration 5	
1-3	Constant with duration 2	
2-3	3/.3 4/.4 5/.3	.2, .1, .9, .3, .2
2-4	6/.3 7/.5 8/.2	.9, .0, .1, .5, .6
3-4	3/.2 4/.7 5/.1	.6, .2, .9, .1, .1

5th Simulation: T12 = 5, T13= 2, fifth random number for T23 is .2, the duration would be 3 days, similarly for T24 and T34 the durations would be 7 and 3 days.



The critical paths are 1-2-4 and the duration is 12.

$0 \le u < .3$	corresponds to T23 = 3
$.3 \le u < .7$	corresponds to T23 = 4
$.7 \le u < 1$	corresponds to T23 = 5
$0 \le u < .3$	corresponds to T24 = 6
$.3 \le u < .8$	corresponds to T24 = 7
$.8 \le u < 1$	corresponds to T24 = 8
$0 \le u < .2$	corresponds to T34 = 3
$.2 \le u < .9$	corresponds to T34 = 4
$.9 \le u < 1$	corresponds to T34 = 5

From above

(a) Distribution of T is

T	12	13	15
Prob.	3/5=.6	1/5=.2	1/5=.2

(b) E(T)

12* . 6+13* .2+15* .2 = 12. 8

(c) P (T ≤ 14)

.6+.2 = .8

(d) Critical index.

SN	1-2	1-3	2-3	2-4	3-4	T
1	1			1		13
2	1		1		1	12
3	1		1		1	15
4	1		1	1	1	12
5	1			1		12
Critical Index	1	0	.6	.6	.6	12.8