IIT ROORKEE

NPTEL ONLINE CERTIFICATION COURSE

Project Management for Managers

Lec – 40

Probability Models in Networks - II

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The distributions of durations of different activities, as assessed by project incharge are as follows.

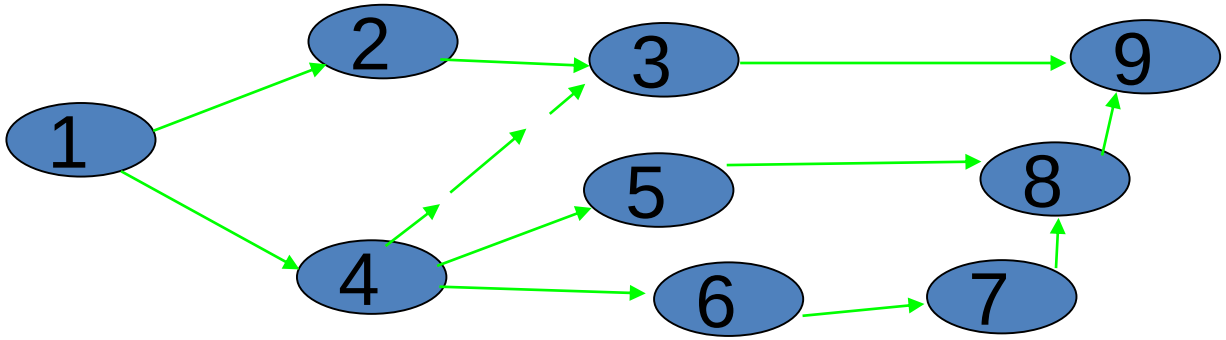
T12	has normal distribution with to = 3 and tp =9
T23	has normal distribution with to = 4 and tp =16
T39	has normal distribution with to = 8 and tp =16
T46	has normal distribution with to = 4 and tp =10
T58	has constant distribution (duration) with 5 days.
T89	has constant distribution (duration) with 4 days.
T34	is a dummy activity.

T45	Prob.
3	.2
4	.3
5	.4
6	.1

T14	Prob.
16	.25
17	.50
18	.25

T67	Prob.
4	.5
5	.5

T78	Prob.
5	.4
6	.6



Find critical path variance along it.

What is the probability that the project will be completed in less than or 40 days.

Find out expected value and variance for all the activities.

If we have an activity (i,j) assumed to have a normal distribution with tp = 9 and to = 3, then we fit normal distribution to the activity.

$\mu = E(X) = (tp+to)/2$ and $\sigma = (tp-to)/6$.

T12 has normal distribution with to = 3 and tp =9

Expected duration of $E(T12) = 6$ and $\sigma^2 = (9-6)/6 = 1$.

Similarly,

expected duration of E(T23) (4,16) = 10 and σ^2= 4

expected duration of E(T39) (8,16) = 12 and σ^2= 16/9

expected duration of E(T46) (4,10)= 7 and σ^2= 1

For the activities with constant duration, we have

E(T58) = 5 and σ^2 = 0.

E(T89) = 4 and σ^2 = 0, and for dummy E(T43) = σ^2 = 0,

Now find expected value and variance of an activity with discrete distribution.

E(T14) = 16*.25+17*.50+18*.25 = 17

T14	Prob.
16	.25
17	.50
18	.25

After finding E (T14) = 17, the variance of T14 is

$V^2\ 14 = E\ (\ T14- E(T14))^{\ 2}$

$= E\ (\ T14- 17)^{\ 2}$

$= E\ (\ 16-17)^2 = 1$

$= E\ (\ 17-17)^2 = 0$

$= E\ (\ 18-17)^2 = 1$

$(T14-17)^2$:	1	0	1
Prob.:	.25	.5	.25

$(V14)^2 = 1*.25+0*.5+1*.25 = 0.5$

T14	Prob.
16	.25
17	.50
18	.25

$E(T45) = .6 + 1.2 + 2 + .6 = 4.4$

$V^2\ 45 = E\ (T45 - E(T45))^2$

$= E\ (T45 - 4.4)^2$

$= E\ (3 - 4.4)^2 = 1.96$

$= E\ (4 - 4.4)^2 = .16$

$= E\ (5 - 4.4)^2 = .36$

$= E\ (6 - 4.4)^2 = 2.56$

T45	Prob.
3	.2
4	.3
5	.4
6	.1

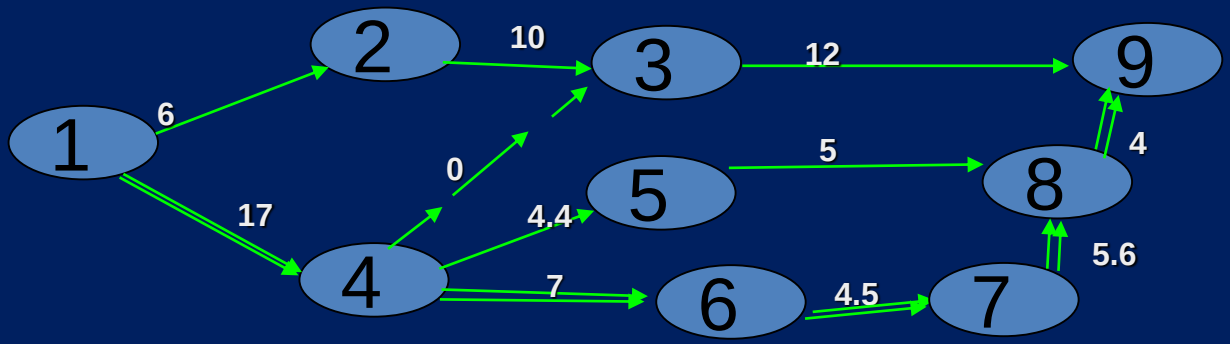
$(T45-4.4)^2$:	1.96	.16	.36	2.56
Prob.:	.2	.3	.4	.1

$V^2\ 45 = 1.96*.2 + .16*.3 + .6*.4 + 2.56*.1 = .84$

For activity 6-7, E(67) and V2 (67) = 4.5 and .25 and

for activity 7-8 , E(78) and V2 (78) = 5.6 and .24

After finding expected values and variance for all the activities find critical path.



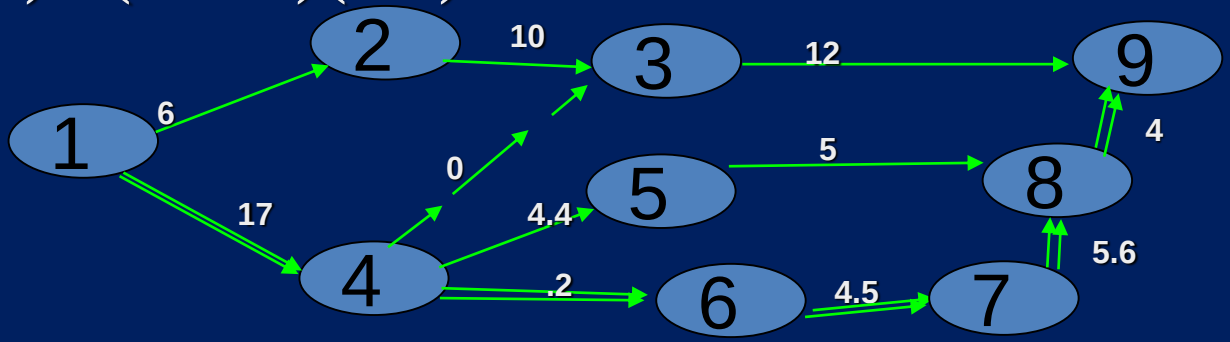
The project duration is 38.1

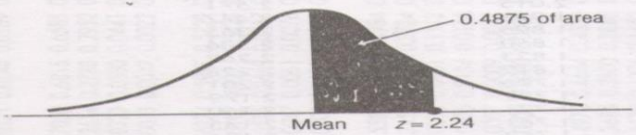
he project duration is : 1-4-6-7-8-9= 17+7+4.5+5.6+4= 38.1 and

Variance: 1-4-6-7-8-9

0.5+1+.25+0.24+0 =1.99 and Std Dev = 1.41

P (T<= 40) = (40-38.1)/(1.41) = 1.35



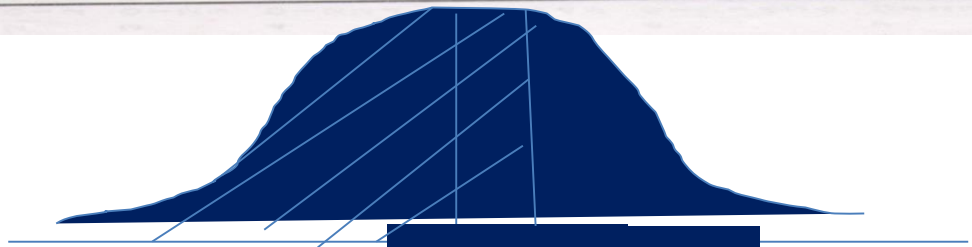


Appendix Table 1

Areas under the Standard Normal Probability Distribution between the Mean and Positive Values of z

Example: To find the area under the curve between the mean and a point 2.24 standard deviations to the right of the mean, look up the value opposite 2.2 and under 0.04 in the table; 0.4875 of the area under the curve lies between the mean and a z value of 2.24.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0,1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.37790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990



38.1 40

.50+0.4115=0.91 =91%