

Επίλυση δικτύων με την μέθοδο PERT/CPM

(1)

Μέθοδος CPM

Απλό δίκτυο

<i>Δραστηριότητα</i>	<i>Προηγούμενες δραστηριότητες</i>	<i>Χρονική διάρκεια</i>
A	–	12
B	A	10
C	B	12
D	A	9
E	D	12
F	C, E	5
G	F	6

Επίλυση απλού δικτύου

*** ACTIVITY SCHEDULE ***

ACTIVITY	EARLIEST START	LATEST START	EARLIEST FINISH	LATEST FINISH	SLACK	CRITICAL ACTIVITY
A	0	0	12	12	0	YES
B	12	12	22	22	0	YES
C	22	22	34	34	0	YES
D	12	13	21	22	1	
E	21	22	33	34	1	
F	34	34	39	39	0	YES
G	39	39	45	45	0	YES

CRITICAL PATH: A-B-C-F-G

PROJECT COMPLETION TIME = 45

Πιο σύνθετο δίκτυο

<i>Δραστηριότητα</i>	<i>Προηγούμενες δραστηριότητες</i>	<i>Χρονική διάρκεια</i>
A	–	3
B	A	4
C	A	5
D	A	3
E	B	2
F	B	6
G	C	7
H	D, E, G	8
I	D	15
J	D, E, F, G	4

Επίλυση πιο σύνθετου δικτύου

*** ACTIVITY SCHEDULE ***

ACTIVITY	EARLIEST START	LATEST START	EARLIEST FINISH	LATEST FINISH	SLACK	CRITICAL ACTIVITY
A	0	0	3	3	0	YES
B	3	9	7	13	6	
C	3	3	8	8	0	YES
D	3	5	6	8	2	
E	7	13	9	15	6	
F	7	13	13	19	6	
G	8	8	15	15	0	YES
H	15	15	23	23	0	YES
I	6	8	21	23	2	
J	15	19	19	23	4	

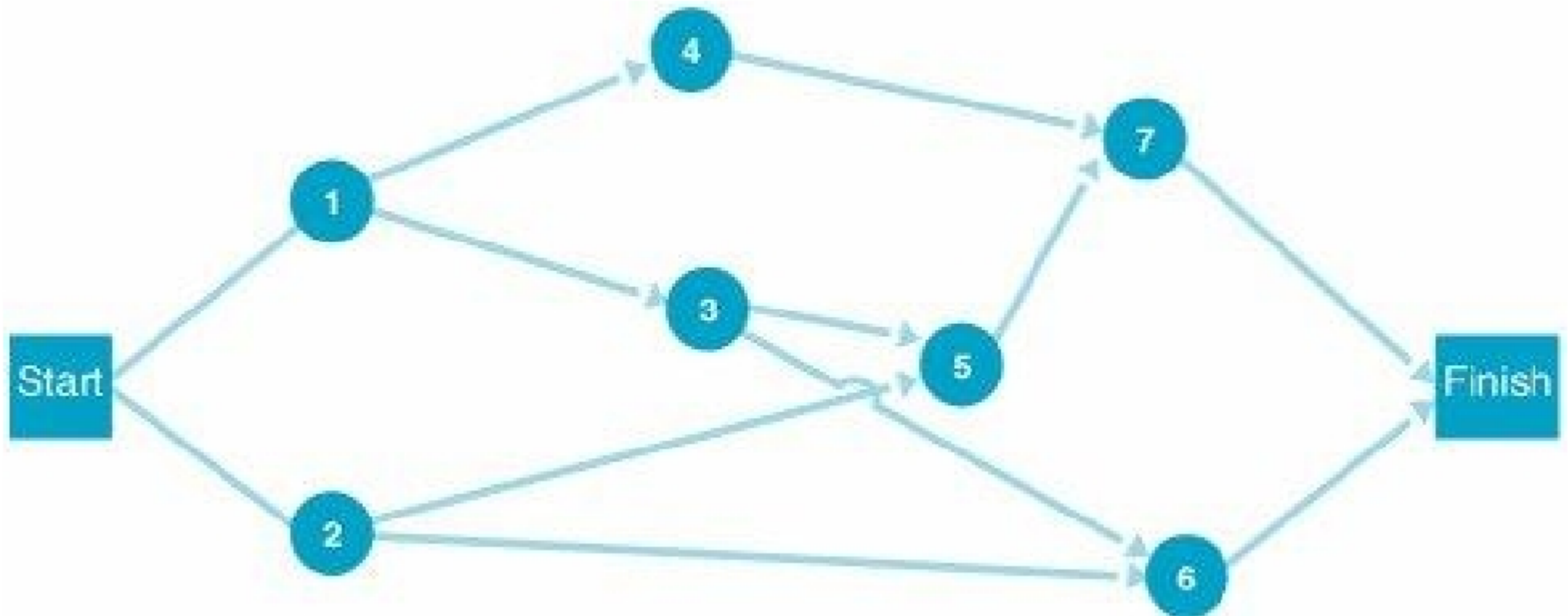
CRITICAL PATH: A-C-G-H

PROJECT COMPLETION TIME = 23

(2)

Μέθοδος PERT

Δίκτυο προς επίλυση με PERT



Στοχαστικοί χρόνοι

Activity	Time Estimates (weeks)		
	a	m	b
1	5	8	17
2	7	10	13
3	3	5	7
4	1	3	5
5	4	6	8
6	3	3	3
7	3	4	5

Αναμενόμενη διάρκεια και διασπορά

$$t = \frac{a + 4m + b}{6}$$

$$v = \left(\frac{b - a}{6} \right)^2$$

Παράδειγμα για δραστηριότητα 1

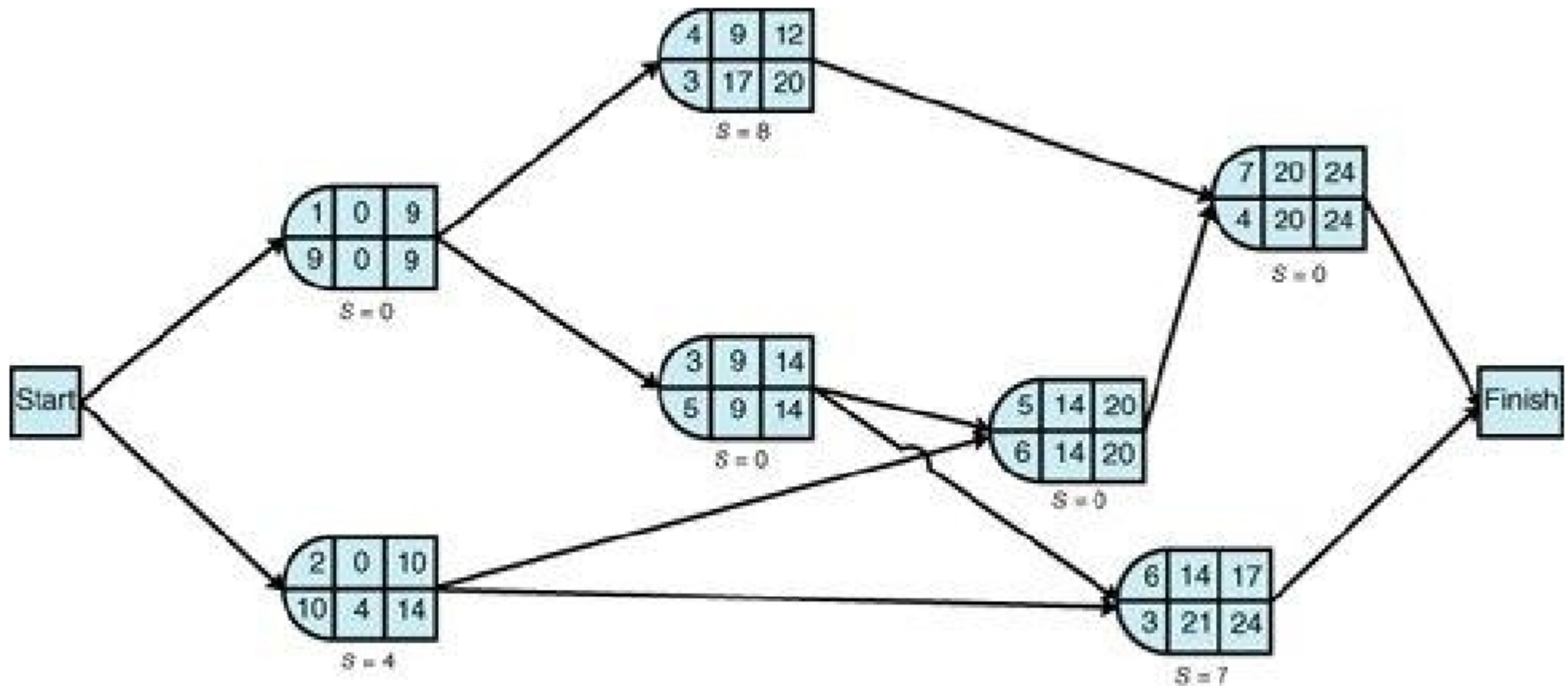
$$t = \frac{5 + 4(8) + 17}{6}$$
$$= 9$$

$$v = \left(\frac{17 - 5}{6} \right)^2$$
$$= 4$$

Αναμενόμενη διάρκεια και διασπορά για όλες τις δραστηριότητες

Activity	t	v
1	9	4
2	10	1
3	5	4/9
4	3	4/9
5	6	4/9
6	3	0
7	4	1/9

Ενωρίτεροι και βραδύτεροι χρόνοι για όλο το δίκτυο

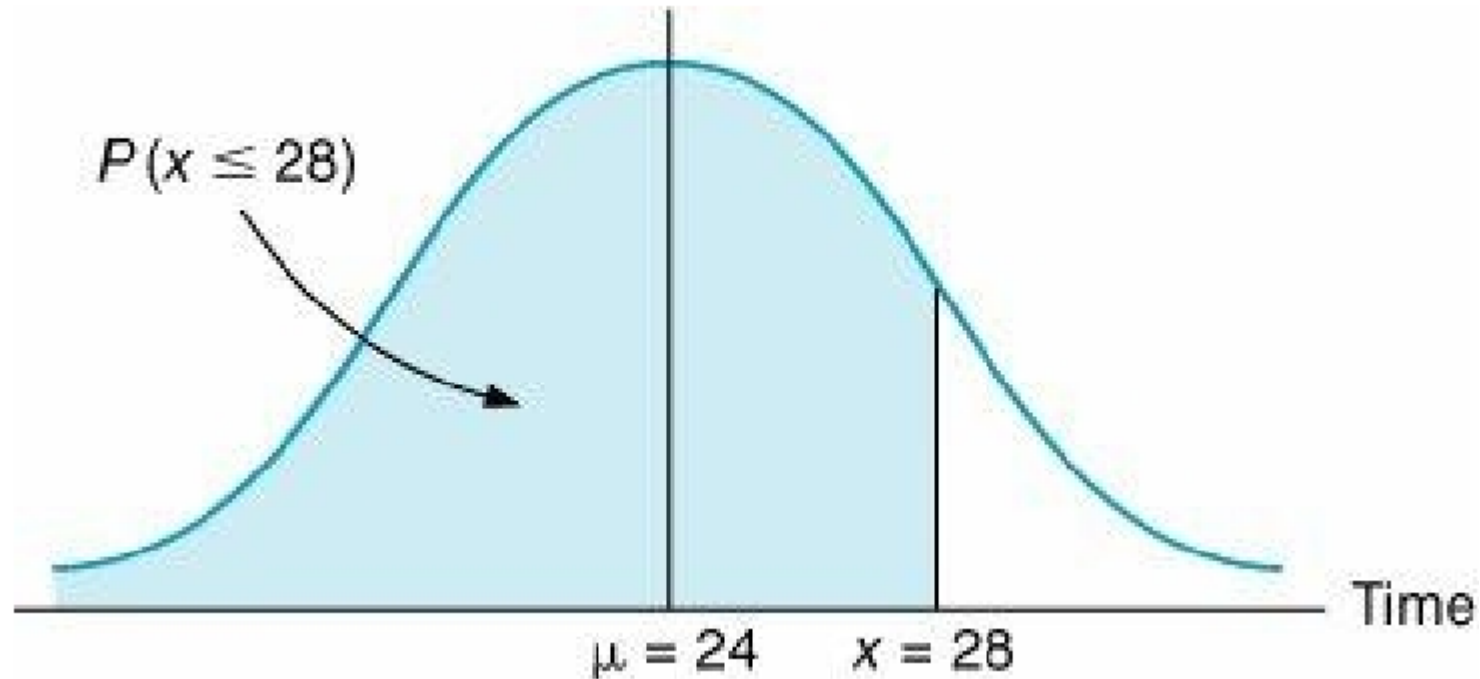


Κρίσιμη διαδρομή και διασπορά αυτής

After observing the foregoing network and those activities with no slack (i.e., $S = 0$), we can identify the critical path as $1 \rightarrow 3 \rightarrow 5 \rightarrow 7$. The expected project completion time (t_p) is 24 days. The variance is computed by summing the variances for the activities in the critical path:

$$\begin{aligned} v_p &= 4 + 4/9 + 4/9 + 1/9 \\ &= 5 \text{ days} \end{aligned}$$

Πιθανότητα να ολοκληρωθεί το δίκτυο εντός 28 εβδομάδων

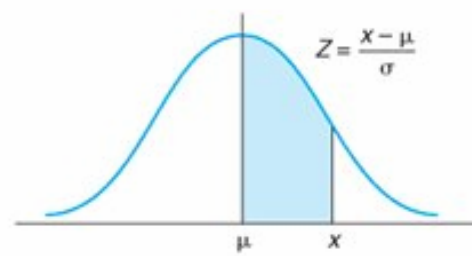


Επίλυση από πίνακες κανονικής κατανομής

$$\begin{aligned} Z &= \frac{x - \mu}{\sigma} \\ &= \frac{28 - 24}{\sqrt{5}} \\ &= 1.79 \end{aligned}$$

The corresponding probability
is .4633; thus,

$$P(x \leq 28) = .9633$$



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990