

Linear Programming and its Extensions (NPTEL) Assignment

1. In the table below, various activities, their normal time, crash time, the normal cost and the crash cost are presented. There is also an indirect cost of Rs. 1200/- per day.

Activity	Normal Time in days	Crash Time in days	Normal cost in 100 Rs	Crash cost in 100 Rs
(1,2)	2	1	12	15
(2,3)	4	2	34	41
(2,4)	6	4	19	22
(2,5)	7	5	14	16
(3,6)	5	3	11	14
(4,7)	7	4	93	99
(5,6)	8	6	46	48
(6,8)	4	3	9	10
(6,9)	5	3	18	21
(7,10)	8	5	13	16
(8,11)	3	1	15	13
(9,11)	6	3	26	30
(10,11)	2	1	3	4

- (i) Let 30th day be the due date for the completion of the project. Compute the early and late start and finish for each activity.
- (ii) Find the optimum duration of the project.

2. A project consists of 10 independent activities as shown in the table below:

Activity	Time	Estimation in days	
	a	m	b
(1,2)	6.5	8	9.5
(1,3)	5	7	9
(2,5)	9.5	14	18.5
(2,6)	6	9	12
(3,4)	4	4	4
(3,5)	7	8	9
(4,5)	2	4	6
(5,6)	4	6	8
(5,7)	6	9	12
(6,7)	3	5	7

- (i) Compute the expected duration and its variance for the project.
- (ii) Find the probability that the project will get completed by the 34th days.
- (iii) What due date D the manager should suggest if he wants the project to be completed by Dth day with 0.95 probability ?
Use the standard normal tables for computing the required probabilities.
- (iv) Probability of completing the project on 33rd day, i.e. on the expected completion day is 0.5, and the probability of completing the project on the 34th day is also close to 0.5. Why ? Is it because of high variance ?

3. For the matrix $P = I - A^t(AA^t)^{-1}A$ show that $P^2 = P$.
Also show that $P^t = P$.
4. Does $(AA^t)^{-1}$ exist?
5. In the primal affine algorithm discussed in the lecture show that if $\theta \leq 0$, the LPP is unbounded.