Exercises in Project Planning

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1. You are given the following information about a project consisting of seven activities (see Table 1).

Activity	**Immediate predecessor**	**Duration (weeks)**
A	–	5
B	–	2
C	B	2
D	A, C	4
E	A	6
F	D, E	3
G	D, F	5

Table 1: Activities for the design of a project network.

   (a) Construct the project network for this project.

   (b) Find earliest time, latest time, and slack for each of the activities. Use this information to determine which of the paths is a critical path?

   (c) If all other activities take the estimated amount of time, what is the maximum duration of activity D without delaying the completion of the project?

2. You are in charge of organising a training seminar for the OR department in your company. Remembering the project management tool in OR you have come up with the following list of activities as in Table 2.

   (a) Find all paths and path lengths through the project network. Which of these paths is a critical path?

   (b) Find earliest time, latest time, and slack for each of the activities. Use this information to determine which of the paths is a critical path?

Activity	Description	Immediate predecessor	Duration (weeks)
A	Select location	–	1
B	Obtain keynote speaker	–	1
C	Obtain other speakers	B	3
D	Coordinate travel for keynote speaker	A, B	2
E	Coordinate travel for other speakers	A, C	3
F	Arrange dinners	A	2
G	Negotiate hotel rates	A	1
H	Prepare training booklet	C, G	3
I	Distribute training booklet	H	1
J	Take reservations	I	3
K	Prepare handouts from speaker	C, F	4

Table 2: Activities in planning the training seminar.

(c) As the proposed date for the training seminar is being moved the training seminar needs to be prepare in less time. Activities with a duration of 1 week cannot be crashed any more, but that takes 2 or 3 weeks can be crashed by one week. Activity K can be crashed by 2 weeks. Given a unit crashing cost of 3000 Euros for the activities C, D and H, 5000 Euros for the activities J and K and 6000 Euros for activities E and F. What does it cost to shorten the project by one week? and how much to shorten it by two weeks?

3. As project manager at *for GoodStuff Enterprises* we have the responsibility for the development of a new series of advanced intelligent toys for kids called *MasterBlaster*. Based on a preliminary idea top management has given us green light to a more thorough feasibility study. As the toy should be ready before the Christmas sale we have been asked to investigate if we can finish the project within 30 weeks.

   The tasks that needs to be carried out during the project is broken down into a set of individual "atomic" tasks called *activities*. For each activity we need to know the duration of the activity and its immediate predecessors. For the MasterBlaster project the activities and their data can be seen in Table 3.

   (a) Derive an AON project network for the project. Find earliest and latest start and finish times. Which activities are on a critical path?

Activity	Description	Immediate predecessor	Duration (weeks)
A	Product design	–	10
B	Market research	–	4
C	Production analysis	A	8
D	Product model	A	6
E	Marketing material	A	6
F	Cost analysis	C	5
G	Product testing	D	4
H	Sales training	B, E	7
I	Pricing	F, H	2
J	Project report	F, G, I	3

Table 3: Activities in project MasterBlaster

(b) Top management reviews our project plan and comes up with a offer. They think 28 weeks will make the product available very late in comparison with the main competitors. They offer an incentive of 40000 Euros if the project can be finish in 25 weeks or earlier.

Quickly we evaluate every activity in our project to estimate the cost of crashing and by how much we can crash each of the activities. The numbers for our project is shown in Figure 4.

Activity	Duration (normal)	Duration (crashing)	Unit Crashing cost
A	10	7	8000
B	4	3	4000
C	8	7	9000
D	6	4	16000
E	6	3	11000
F	5	3	6000
G	4	3	7000
H	7	3	5000
I	2	2	—
J	3	2	9000

Table 4: Crashing activities in project MasterBlaster.

What is the cheapest way of reducing the project duration to 25 weeks and how? Do we take the offer by the management?

(c) Let us assume that the incentive scheme set forward by the top management instead of giving a fixed date and a bonus specified a daily bonus. Suppose that we will get 8500 Euros for each week

we reduce the project length. Describe how this can be solved in our LP model and what the solution for the project will be.

Construct the project crashing curve that presents the relationship between project length and the cost of crashing until the project is crashed by 4 weeks.