A	*	0	0	9	9	9	–	–	–
B		0	0	11	18	3	15	8	8
C	*	9	9	17	17	8	–	–	–
D		9	9	11	18	2	7	–	–
E		9	9	18	22	3	10	6	6
F		17	17	19	22	2	3	–	–
G	*	17	17	23	23	6	–	–	–
H		17	17	18	22	1	4	–	–
J		11	18	19	22	4	7	4	–
K		19	22	23	23	1	3	1	–
L	*	23	23	25	25	2	–	–	–
M		18	22	25	25	3	4	4	–
N	*	25	25	29	29	4	–	–	–

* Critical activities — Float calculations

Project XXX. Table 1

The total float on the non critical chains can also be calculated:

Non-critical chain	Time required	Time available	Total float over chain
B, J, K	8	23	15
D, J, K	7	14	7
F, K	3	6	3
E, M	6	16	10
H, M	4	8	4
E, dummy	3	14	9
H, dummy	1	6	5

Slack

7. This is the difference between the EST and LST for each event. Strictly it does not apply to activities but on occasions the terms are confused in examination questions and unless the context makes it abundantly clear that event slack is required, it is likely that some form of activity float is required. Events on the critical path have zero slack.

Further project time analysis

8. More sophisticated time analysis presupposes that some form of distribution is available for each activity time estimate, for example, the three time estimates described in Para 2. These can be used to make statements about the probability of achieving scheduled dates.

   Probability example. Assume that a simple project has the following network shown in Fig 23/7. The activity times are in weeks and three estimates have been given for each activity. The expected durations can be found using what is known as the PERT formula:

$$\frac{\text{Optimistic time} + \text{Pessimistic time} + 4 \times \text{Most likely time}}{6}$$

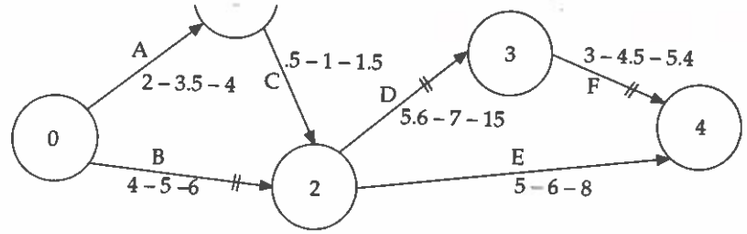

Figure 23/7

Critical path (B, D, F) expected duration

$$B = \frac{4 + 6 + 4(5)}{6} = 5 \text{ weeks}$$

$$D = \frac{5.6 + 15 + 4(7)}{6} = 8.1 \text{ weeks}$$

$$F = \frac{3 + 5.4 + 4(4.5)}{6} = \underline{4.4}$$

$$\underline{17.5}$$

If the critical activities were to occur at their optimistic times, event 4 would be reached in 12.6 weeks but if the critical activities occurred at their pessimistic times, event 4 would be reached in 26.4 weeks. As these durations span the scheduled date of week 19 some estimate of the probability of achieving the schedule date must be calculated, as follows.

a) Make an estimate of the Standard Deviation for each of the critical activities. If no additional information is available the following PERT formula can be used.

$$\frac{\text{Pessimistic time} - \text{Optimistic time}}{6}$$

i.e. Standard Deviation

$$\text{Activity B} = \frac{6 - 4}{6} = \mathbf{0.33}$$

$$\text{Activity D} = \frac{15 - 5.6}{6} = \mathbf{1.57}$$

$$\text{Activity F} = \frac{5.4 - 3}{6} = \mathbf{0.4}$$

b) Find the standard deviation of event 4 by calculating the statistical sum (the square root of the sum of the squares) of the standard deviations of all activities on the critical path.

$$\text{i.e. Standard Deviation of Event 4} = \sqrt{0.33^2 + 1.57^2 + 0.4^2}$$

$$= \mathbf{1.65} \text{ weeks}$$