(a) The project is analyzed by determining all the individual activities (sometimes called tasks/jobs/operation) that must be performed to complete it.
(b) A planned sequence of these activities are shown on a network (a graph where arrow and circles represent the relationship among project activities)

2. Schedule of project

(a) How long it will take to perform each activity is estimated.
(b) In order to locate the critical path, calculation is performed (the longest time chain of sequential activities which determines the duration of project). This step also provides other information that is useful in scheduling.
(c) The above information are used to develop a more economical and efficient schedule.

3. Project monitoring

(a) The plan and schedule started above are used to monitor the progress.
(b) Throughout the execution of project, the schedule is revised and updated so that the schedule represents the current plan and status of progress.
(c) PERT, Critical path, Most likely time estimates.

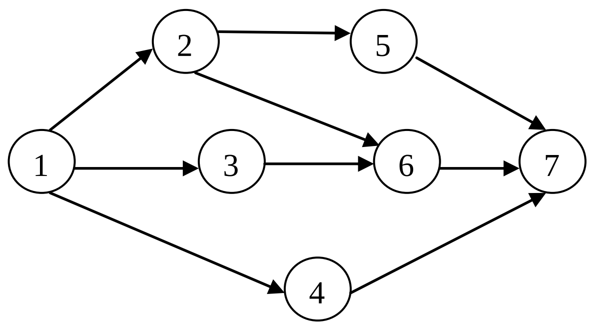
The above points can be explained with the following examples.

Ex: 1 A project consists of the following activities and time estimates.

Activity	Least time (t_0) in days	Greatest time (t_p) in days	Most likely time (t_m) in days
1-2	3	15	6
1-3	2	14	5
1-4	6	30	12
2-5	2	8	5
2-6	5	17	11
3-6	3	15	6
4-7	3	27	9
5-7	1	7	4
6-7	2	8	5

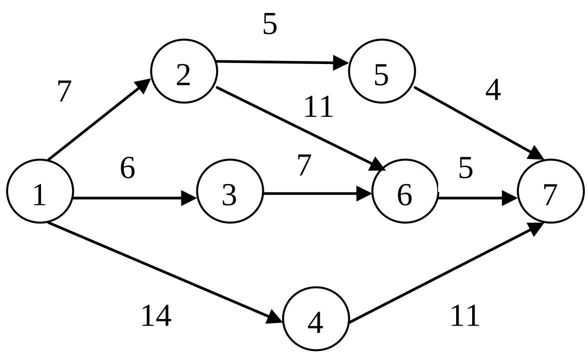
Construct the network. Determine the expected task time and the critical path.

Solution: The network diagram is shown below:



Expected task time (t_e) = $(t_0 + 4t_m + t_p)/6$
Using this formula, t_e for different activities are shown below.

Activity	t_e value
1-2	7
1-3	6
1-4	14
2-5	5
2-6	11
3-6	7
4-7	11
5-7	4
6-7	5



From the above figure, 1-4-7 is the critical path. The project duration is 14+11 = 25 days.

Resource levelling

There are two types of resource problem

(i) Resource smoothing
(ii) Resource levelling

(i) Resource smoothing:

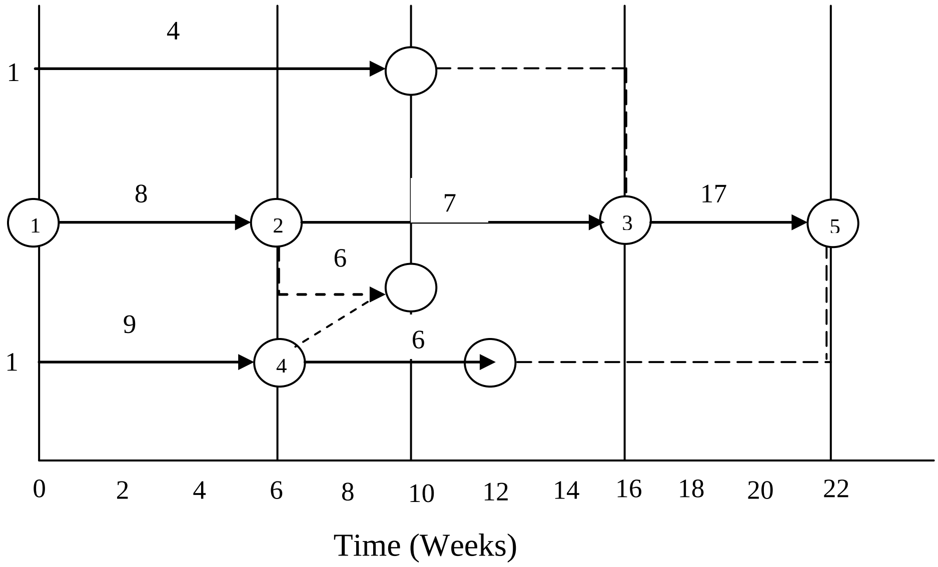
There may be a ceiling on the availability of resources in a particular period of time. For instance, only Rs 125 lakh per annum may be available to the project and if unutilized during the year, the remaining amount lapses. The resource analysis used for this type of case is called Resource smoothing.

(ii) Resource levelling:

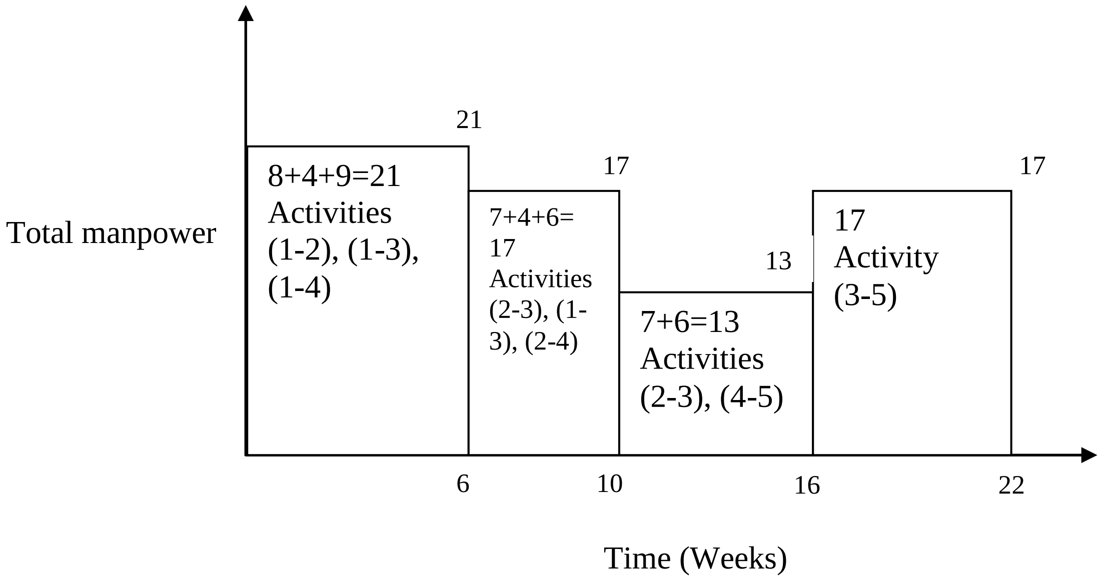
A resource may be required to be used in a uniform manner. For instance, in the present day labour situation one cannt have 100 labourers yesterday, 30 today and 80 tomorrow. Once a labour is hired, it is difficult to hire him. The rate of usage of labour has to be uniform. Resource analysis used for this category of problems is called Resource levelling.

Example: Consider the following problem of project scheduling. Obtain a schedule which will minimize the peak manpower requirement and smooth out period to period variation of manpower requirement.

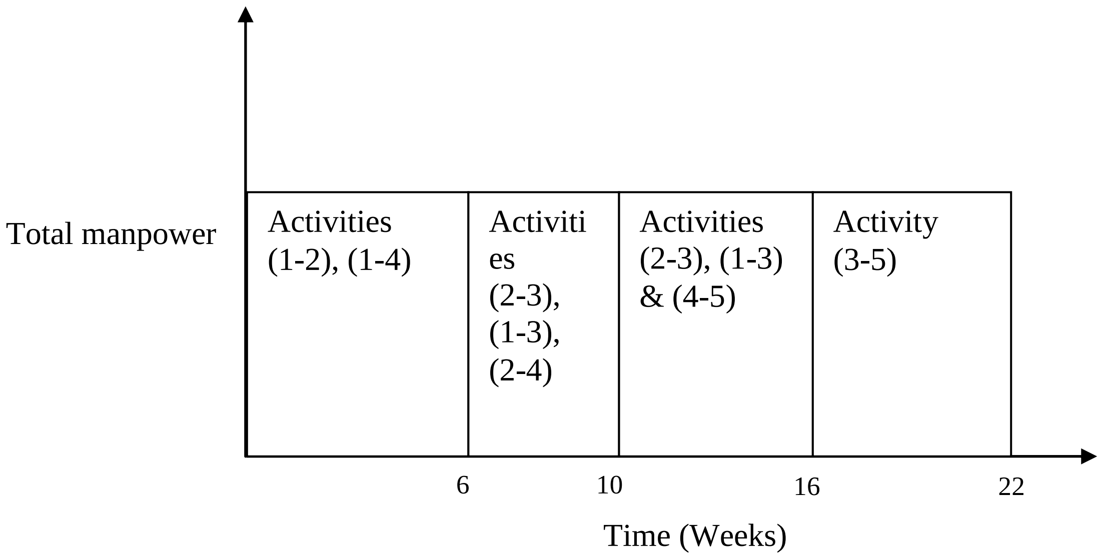
Activity	Duration in Weeks	Manpower requirements
1-2	6	8
1-3	10	4
1-4	6	9
2-3	10	7
2-4	4	6
3-5	6	17
4-5	6	6



The corresponding manpower requirement histogram is shown below.



From this figure, it is observed that the peak manpower requirement is 21 and it occurs from 0 to 6 weeks. The activities which are scheduled during the period are: (1-2), (1-3) and (1-4). The activity 1-2 is critical activity. So it should not be disturbed. Between activities (1-3) and (1-4), the activity (1-3) has high slack value of 6 weeks (whereas its only 4 weeks for (1-4)). Hence, it can be started at the end of 6 weeks. The corresponding modification is shown by the following histogram.



The manpower requirement is now smooth throughout the project duration.