Unit - 4 :-

RESOURCE MANAGEMENT

(Manpower and Material)

Introduction

A resource is a Physical Quantity Such as manpower, material, money, Equipment, time or Space, which are required for carrying out a Project.

While developing CPM and PERT networks we generally assume that Sufficient resources are allocated to Perform the various activities and Complete the Project.

But in real Practice, resources are always limited and limitation on resources can significantly affect the initiation, Performance and completion of activities on the Scheduled time and can cause the Project to be extended beyond the Scheduled duration.

Therefore, the various activities of the Project are to be Scheduled in Such a manner that there is best Possible utilisation of available resources.

Resource Smoothing

In duration of Completion of the Project is the Constraint, then Resource Smoothing Should be applied with out changing the total Project duration.

The Periods of minimum demand for resources are located and the activities are Shifted according to the float availability and requirement of resources.

Thus the intelligent utilisation of floats can Smoothen the demand of resources to the maximum Possible extent,

This type of resource allocation is called "Resource Smoothing"

Steps Involved in Resource Smoothing.

→ List out the resources which will be required for Execution of the various activities and identify the ones which are considered important.

→ Resource Profiles are Prepared by Carrying out the resource aggregation Exercise and cumulative resource requirements for each unit are Plotted in the form of histograms.

→ The Periods of Peak and low demands are identified and an attempt is made to lower the Peaks and to fill up the troughs.

→ If there is no Constraint on the availability.

of resources, make the demand as uniform as-possible.

This can be achieved by altering the times of start & finish of non-critical activities, to start with.

These activities have certain amount of float.

Therefore, the available float can be used for making adjustments in the start or finish of the activities concerned and thus, lowering of the peak demands by staggering of the resource requirements without delaying the Project duration.

Resource Levelling

There are various activities in a Project demanding varying levels of resources. The demand on certain Specified resources should not go beyond the Prescribed level.

In the Process of resource levelling, whenever the availability of resource becomes less than its maximum requirement, the only alternative is to delay the activity having larger float.

In case, two or more activities require the same amount of resources, the activity with minimum duration is choosen for resource allocation.

Resource levelling is done if the restriction is on the availability of resources.

Steps involved in Resource Levelling.

→ Lower the Peak requirement of the resources by Staggering the resource-input on non-critical activities. If necessary, Sub-critical and critical activities can also be tackled to bring Peak demands below the Specified levels. Thus, Completion of work may be delayed due to resource constraints.

→ Either increase the duration of critical activities or Place some of the Concurrent

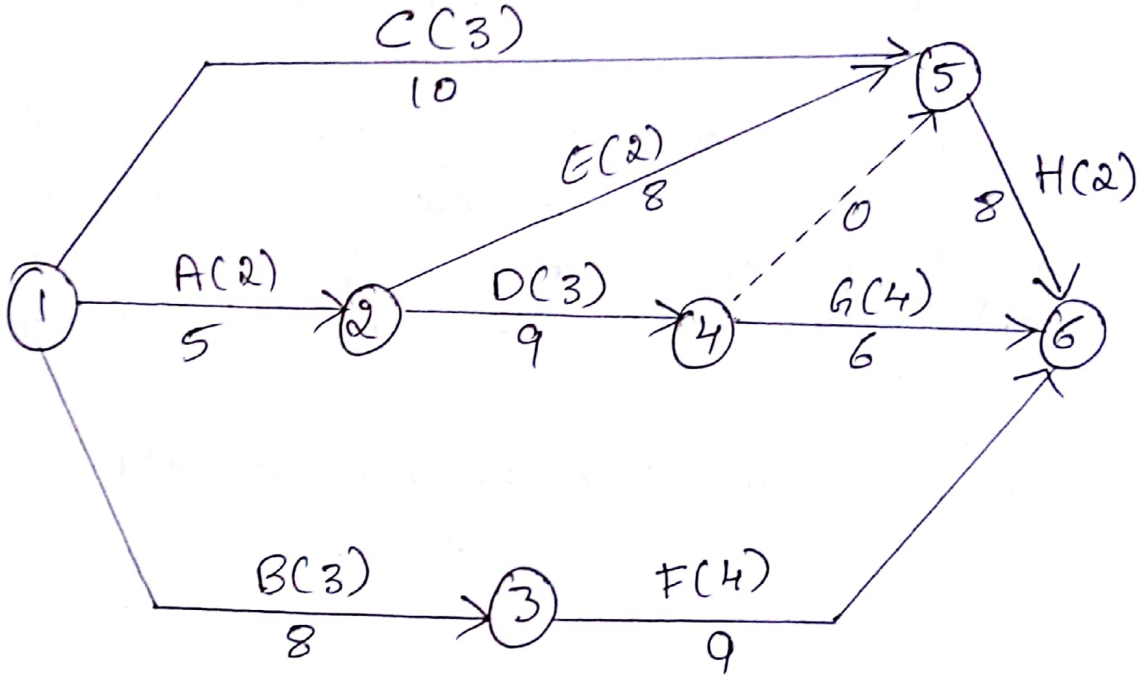
Activities in series to reduce the Peak - demands of the scarce resources. This will increase the duration of the Project.

→ Re-arrange the activities in decending order of the magnitude of the Positive float, as - resources can be conveniently diverted from the activities which Possess large ~~zero~~ amount of float. Firstly lower the high Peaks of the - resource demand by utilising the free floats of the activities. Then non-critical activities should be rescheduled to the extent required by utilising the floats, starting with activities having the highest float.

Critical activities can be tackled last, if necessary.

Problem

* Determine the aggregate resource requirements, Period-by-Period for the the network given below. The figures over the arrows indicate the requirement of mason and the figures below the arrows are the durations of the activities for the Project.



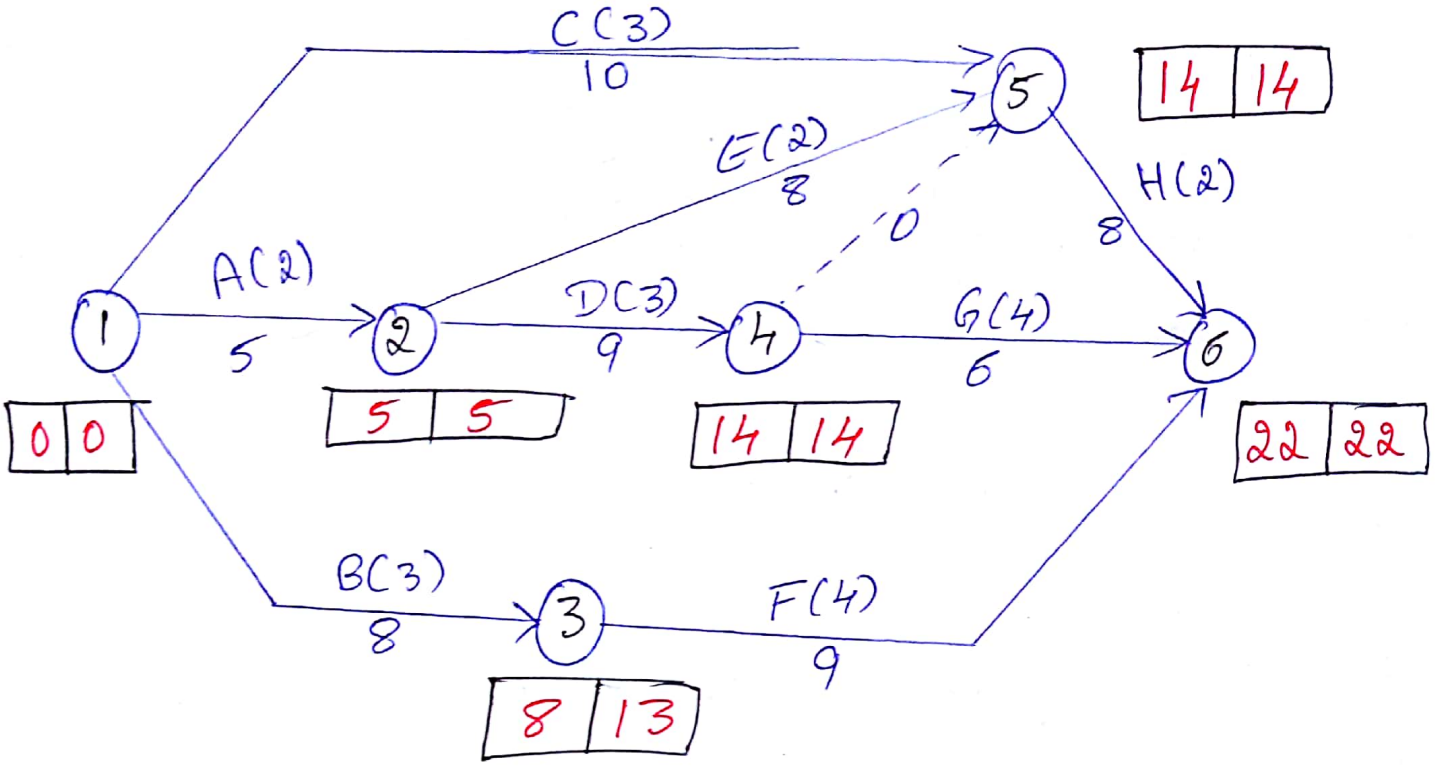
Smooth out the requirements of the resource and indicate the resulting revised Schedule.

⟹ Solution.

First we calculate the earliest and latest activity times and floats for each activity as below.

Activity	EST	EFT	LST	LFT	Float	Remarks.
A	0	5	0	5	0	Critical Activity
B	0	8	5	13	5	
C	0	10	4	14	4	
D	5	14	5	14	0	Critical Activity.
E	5	13	6	14	1	
F	8	17	13	22	5	
G	14	20	16	22	2	
H	14	22	14	22	0	Critical Activity

⟶ Continued



Therefore, Critical Path is along, 1-2-4-5-6 = 22 days. Now, according to earliest start time, the cumulative resource (mason) is - calculated for each day as below.

Sl. No.	Duration in days	Activity	Resource in units	Total Resource Requirement each day
1	1	A, B, C	2, 3, 3	8
2	2	A, B, C	2, 3, 3	8
3	3	A, B, C	2, 3, 3	8
4	4	A, B, C	2, 3, 3	8
5	5	A, B, C	2, 3, 3	8
6	6	B, C, D, E	3, 3, 3, 2	11
7	7	B, C, D, E	3, 3, 3, 2	11
8	8	B, C, D, E	3, 3, 3, 2	11
9	9	C, D, E, F	3, 3, 2, 4	12
10	10	C, D, E, F	3, 3, 2, 4	12
11	11	D, E, F	3, 2, 4	9
12	12	D, E, F	3, 2, 4	9
13	13	D, E, F	3, 2, 4	9
14	14	D, F	3, 4	7
15	15	F, G, H	4, 4, 2	10

16	16	F, G, H	4, 4, 2	10
17	17	F, G, H	4, 4, 2	10
18	18	G, H	4, 2	6
19	19	G, H	4, 2	6
20	20	H, G	2, 4	6
21	21	H	2	2
22	22	H	2	2

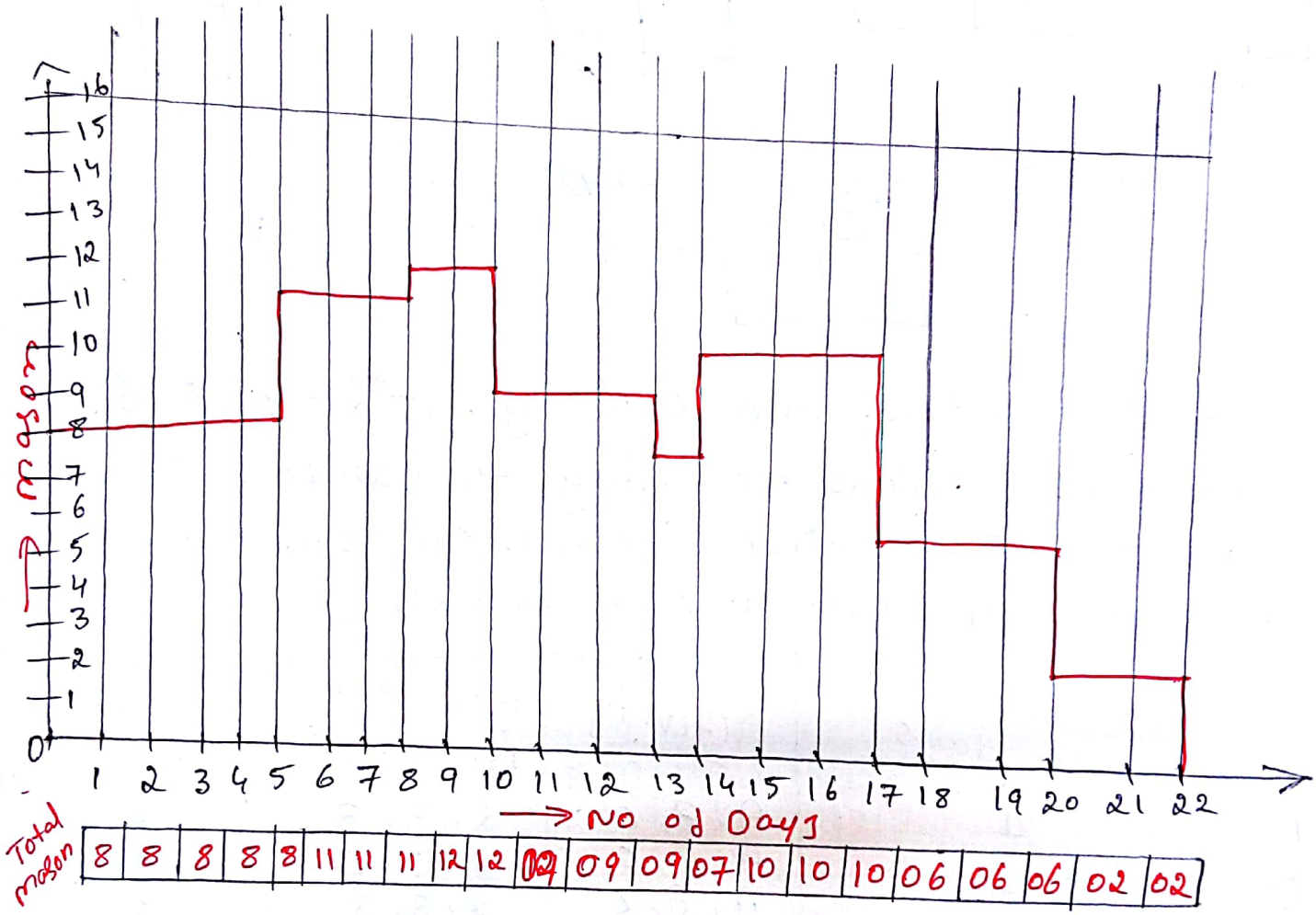
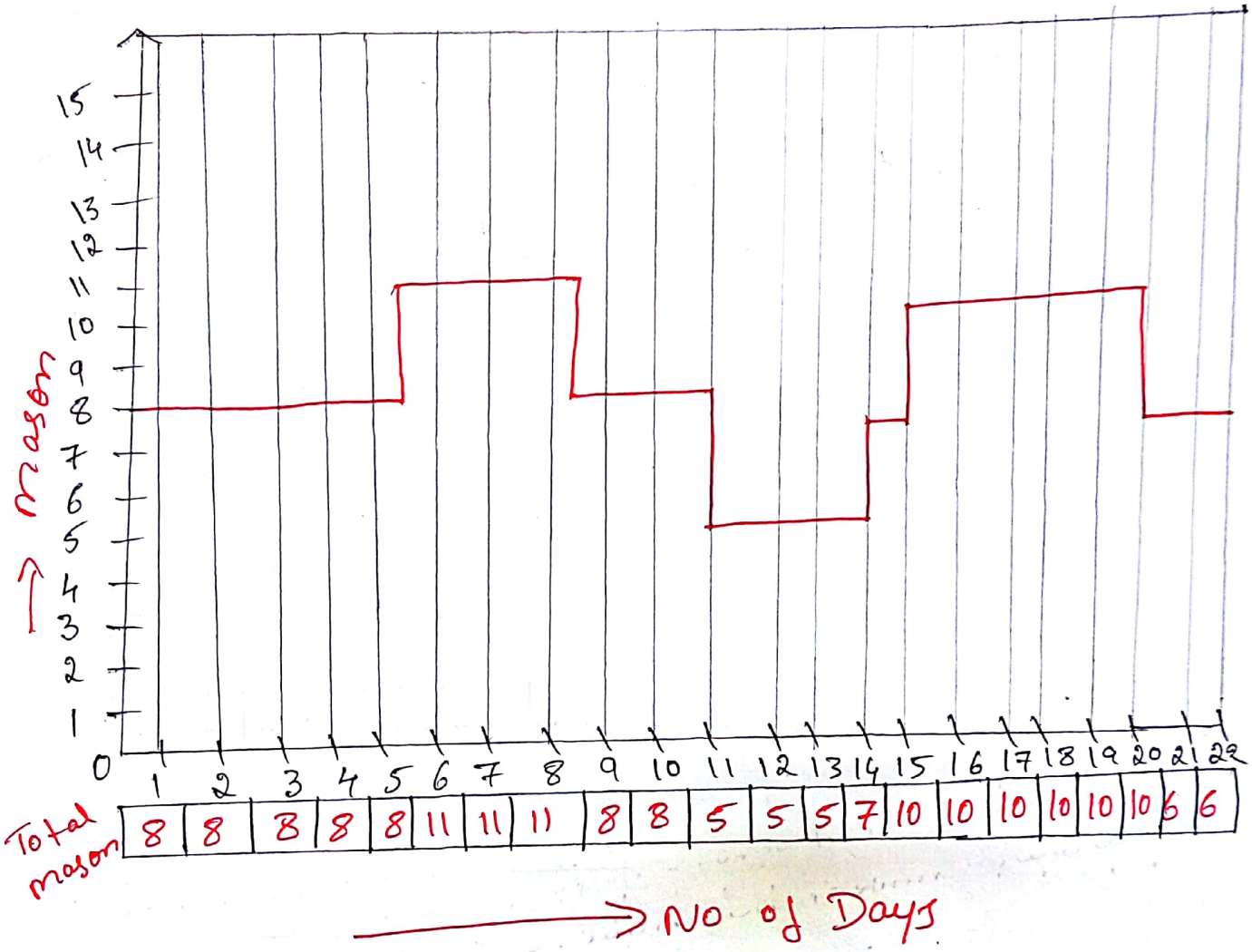


Fig Showing Period by Period resource requirements for the Schedule.

Here, we find that the requirements of masons on 6th day to 17th day are high. However, the requirements of mason on 18th day onwards is low. By inspecting the network, we find that the activities 1-3(B) and 3-6(F) have a total float of 5 days. Hence the start time of activity

F can be shifted by 5 days so that it starts on 14th day instead of the 9th day. The following fig shows the revised histogram.



From the fig, we find that the Peak demand for mason has decreased from 12 to 11. This will result in Smoothening the mason requirements.

Thus, following this Procedure, it is always Possible to Smoothen the resource requirements with out affecting the Project duration.