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CIVIL ENGINEERING

CONVENTIONAL Practice Sets

CONTENTS

CONSTRUTION PRACTICE, PLANNING & MANAGEMENT

1 CHAPTER
Construction Planning and Management

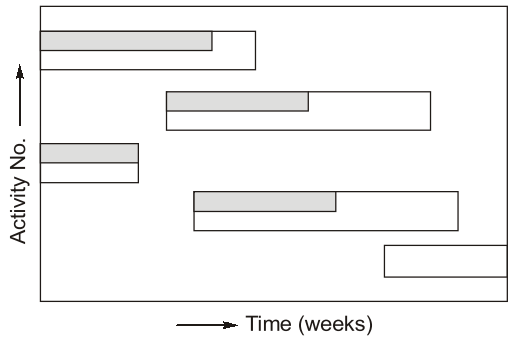
Q.1 Briefly answer the following:

(i) How can an existing bar chart be modified to depict the project progress made?

(ii) Differentiate between 'Forward Planning' and 'Backward Planning' for network construction.

Solution:

(i) A bar chart doesn't show the progress of work and hence it cannot be used as a control device. Controlling is essential for rescheduling the remaining activities. However, an existing bar chart can be modified to depict the progress made. This can be done by showing the progress of each of each activity, by hatched lines along the corresponding bar of the activity. Generally, hatching is done in half the width of the bar.



(ii) 'Forward Planning': In this method, the planner starts from the initial event and builds up the events and activities logically and sequentially until the end event is reached. In this method, while considering activity, a planner asks himself the following questions:

What event comes next?

What are dependent events?

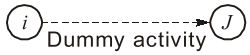
What events can take place concurrently?

Backward planning: In this method, the planner starts with the end event and arranges the events and activities until the initial event is reached. Keeping the goal in view, the planner asks himself if we want to achieve this, what events or activities should have taken place.

Q.2 Define 'dummy operation' and discuss its purpose in a network.

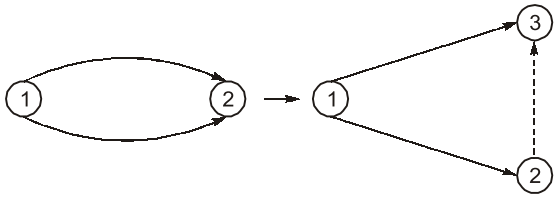
Solution:

Dummy operation: A dummy is a type of operation in the network which neither requires any time nor any resources, but act as merely as a device to identify a dependence among operations in activity on arrow diagram. A dummy is thus a connecting link for control purpose or for maintaining uniqueness of activity. A dummy is represented by arrow but since it is not really an activity it is represented by dashed arrow.



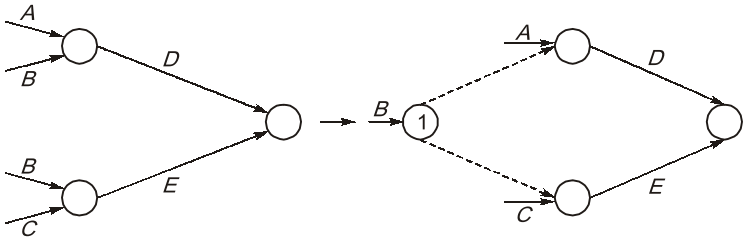
Dummy activity serves two purposes in a network:

(a) **Grammatical purpose:** A dummy is used to prevent two arrows having same beginning and end point, so as to maintain uniqueness of an activity in activity on arrow network diagram.



Incorrect representation Correct representation

(b) **Logical purpose:** Dummy also is used to give logical clear representation in a network having an activity common to two set of operations running parallel to each other.



Incorrect representation Correct representation

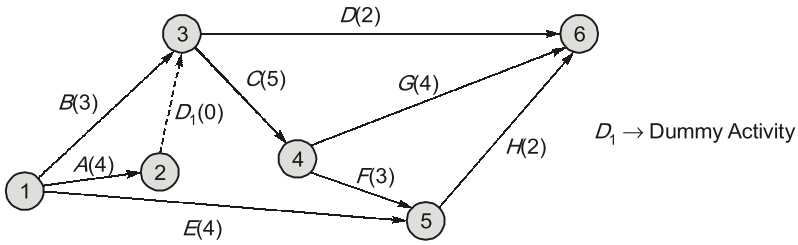
Q.3 A construction project consists of 8 major activities. Their interdependency is given below. Draw the network and determine the time for completion of the project. also mention duration for each path.

(i) Activities *A*, *B* and *E* can start concurrently. (Starting of the project)
(ii) Activities *C* and *D* are concurrent and depend on the completion of *A* and *B*.
(iii) Activities *F* and *G* are concurrent and can start after completion of *C*.
(iv) Activity *H* depends on the completion of *C*, *E* and *F*.
(v) Project ends with the completion of *G* and H.

Time needed for each activity is

A — 4 weeks *B* — 3 weeks *C* — 5 weeks *D* — 2 weeks
E — 4 weeks *F* — 3 weeks *G* — 4 weeks *H* — 2 weeks

Solution:



The paths of project are as follows:

S.No.	Path	Duration along path (weeks)
1.	$B \rightarrow D$	5
2.	$A \rightarrow D_1 \rightarrow D$	6
3.	$B \rightarrow C \rightarrow G$	12
4.	$B \rightarrow C \rightarrow F \rightarrow H$	13
5.	$A \rightarrow D_1 \rightarrow C \rightarrow G$	13
6.	$A \rightarrow D_1 \rightarrow C \rightarrow F \rightarrow H$	14
7.	$E \rightarrow H$	6

$\therefore$ The time taken for the completion of project is 14 weeks.

Q.4 What are the deficiencies of bar chart?

Solution:

A bar chart has following deficiencies:

- It can only be used for small and simple project.
- It is used only for project that are repetitive in nature.
- As bar chart lacks in showing project progress. It makes controlling of project with bar chart difficult.
- In bar chart sub-activities of an activity cannot be represented, so bar chart lacks in degree of details.
- Interdependencies between the activities cannot be depicted in bar chart.
- Critical and non-critical activities are not separated by use of bar chart.

Q.5 Explain various steps involved in the development of networks.

Solution:

Various steps involved in the development of networks are as follows:

(i) **Objective:** During the planning of a project, the first and foremost step is to define the project and to decide the way in which it is to be carried out. The task to be undertaken requires to be set down as specific, definite, complete and well defined verbal statement. Specific verbal statement means the specific description of particular dimensions, type of materials, plants, etc. necessary for the project. Objective specifies the task to be undertaken and policy of its execution. This specification defines the project and determines the way in which it is to be carried out.

(ii) **Plan breakdown:** After establishing objective of the task, the planner has to adopt either forward planning or backward planning (or mixed planning) to achieve the goal. This backward to forward thinking will give a list of activities or jobs to be performed to achieve the task and also stages in the project execution.

(iii) **Sequencing:** In the second step we have obtained a general list of various activities and events necessary for the completion of the project. This general list is to be reviewed so that in each of the main group, those with definite similarities can be put in suitable subgroups.

(iv) **Location of nodes:** Now the events listed above are required to be located on paper so that a visual effect of movement along a time scale is obtained. Events should be located in such a way that they represent initial picture of the relation amongst them. This relationship results from the proposed use of manpower, money, material and other resources during a particular period of time.

(v) **Drawing Arrows:** Events having close and direct relationship are joined to each other by arrows representing activity to be performed for passing from one stage of the project to the other. These activities should fall in logical sequence.

(vi) **Checking:** At this stage, the diagram is checked with respect to content, sequence and sense and degree of detail.

It is essential to check the diagram for events and activities in respect of logic and accuracy. Particular attention should be paid to multiple events, i.e., those events at which more than one arrows enters and/or more than one arrows leave, since it is at this point that errors are most likely to occur. The checking ensures that the network correctly represents the sequence.

It should be ensured that network does not contain loops or cycles. If located these should be removed. Also, it should be checked whether there is any event (other than first) which has only outgoing arrows, or whether there is any event (other than last one) which has only incoming arrows. Such situation, if found, should be rectified. There should be no dead ends left.

An arrow should always represent singular situation but an event may represent commencement of more than one operations. In respect of sufficient detail, a ratio, known, as *E*/*A* ratio given as

$$\frac{E}{A} = \frac{\text{Total number of events}}{\text{Total number of activities}}$$

In a good network, its value should lie between 1 to 1.6.

(vii) **Redraw:** The errors found in the previous steps are removed and the diagram is redrawn by introducing unique dummies, if necessary.

(viii) **Number:** After drawn the final network, the events are numbered using Fulkerson's rule.

Q.6 What are different methods of construction project planning? Explain any one in detail.

Solution:

Planning is the first step of project management philosophy of planning, organizing and controlling the execution of the projects. Project planning and project scheduling is two separate and distinct function of the project management.

Methods of Planning:

There are several types of project planning. The three major types of construction project planning are:

1. **Strategic planning:** This involves the high-level selection of the project objectives
2. **Operational planning:** This involves the detailed planning required to meet the strategic objectives
3. **Scheduling:** This puts the detailed operational plan on a time scale set by the strategic objectives

Operational Planning:

Operational planning is done by construction teams. They ask certain questions before making operational plan for the project. They are:

1. Will the operational plan meet the strategic planning target date?
2. Are sufficient construction resources and services available within the company to meet the project objectives?
3. What is the impact of the new project on the existing work load?
4. Where will we get the resources to handle any overload?
5. What company policies may prevent the plan from meeting the target date?
6. Are usually long delivery equipment or materials involved?
7. Are the project concepts and design firmly established and ready to start the construction?
8. Is the original contracting plan still valid?
9. Will it be more economical to use a fast-track scheduling approach?

All these questions are answered in preparation of the construction master plan before detailed scheduling of the project.

Q.7 Draw a PERT network for the following project:

(i) *A* is the first or start event and *K* is the end event
(ii) *J* is the successor event to *F*
(iii) *C* and *D* are successor events to *B*
(iv) *D* is a preceding event to *G*
(v) *E* and F occur after event *C*
(vi) *E* precedes *F*
(vii) *C* restrains the occurrence of *G* and *G* precedes *H*
(viii) *H* precedes *J*
(ix) *F* restrains the occurrence of *H*
(x) *K* succeeds event *J*