24 Network analysis – cost scheduling

Objectives

1. After studying this chapter you will
   - understand the principles of least cost scheduling or 'crashing' the network
   - know the meaning of: normal and crash costs, normal and crash times, and cost slopes
   - be able to use the rules of least cost scheduling
   - know how to crash a network.

Costs and networks

2. A further important feature of network analysis is concerned with the costs of activities and of the project as a whole. This is sometimes known as PERT/COST.

Cost analysis objectives. The primary objective of network cost analysis is to be able to calculate the cost of various project durations. The *normal duration* of a project incurs a given cost and by more labour, working overtime, more equipment etc the duration could be reduced but at the expense of higher costs. Some ways of reducing the project duration will be cheaper than others and network cost analysis seeks to find the cheapest way of reducing the overall duration.

Penalties and Bonuses. A common feature of many projects is a penalty clause for delayed completion and/or a bonus for earlier completion. In examination questions, network costs analysis is often combined with a penalty and/or bonus situation with the general aim of calculating whether it is worthwhile paying extra to reduce the project time so as to save a penalty.

Cost and networks – basic definitions

a) Normal cost. The costs associated with a normal time estimate for an activity. Often the 'normal' time estimate is set at the point where resources (men, machines etc) are used in the most efficient manner.

b) Crash cost. The costs associated with the minimum possible time for an activity. Crash costs, because of extra wages, overtime premiums, extra facility costs are always higher than normal costs.

c) Crash time. The minimum possible time that an activity is planned to take. The minimum time is invariably brought about by the application of extra resources, e.g. more labour or machinery.

d) Cost slope. This is the average cost of shortening an activity by one time unit (day, week, month as appropriate). The cost slope is generally assumed to be linear and is calculated as follows:

$$\text{Cost slope} = \frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$$