

Activity planning.

- An activity plan should provide a means of **evaluating the consequences of not meeting any of the activity target dates** and guidance as to how the plan might most effectively be modified to bring the project back to target.

Objectives of activity planning.

- **Feasibility assessment >>>**
 - Is the project possible within required timescales and resource constraints?
- **Resource Allocation>>>**
 - What are the most effective ways of allocating resources to the project and when should they be available?
 - Timescale vs resource availability
- **Detailed costing>>>**
 - How much will the project cost and when is that expenditure like to take place?
- **Motivation>>>**
 - Providing targets and monitoring achievement against targets is an effective way of motivating staff, particularly where they have been involved in setting those targets in the first place.

- **Co-ordination>>>**

- When do the staff in different departments need to be available to work on a particular project and when do staff need to be transferred between projects?

When to plan

- Planning is **an ongoing process of refinement**, each iteration becoming more detailed and more accurate than the last.
- During feasibility study and project start up>>>
 - the main purpose of planning will be **to estimate timescales and the risks of not achieving target** completion dates or keeping within budget
- As the project proceeds beyond the feasibility study, the emphasis will be placed upon the production of activity plans for **ensuring resource availability and cash flow control**.
- Throughout the project, until the final deliverable has reached the customer, monitoring and re-planning must continue to correct any drift that might prevent meeting time or cost targets.

Project Schedule

- Before work commences on a project, the project plan must be developed to the level of **showing dates when each activity should start and finish** and **when and how much of each resource will be required**.
- Once the plan has been refined to this level of detail, we call it a *project schedule*.
- Creating a project schedule *comprises four main stages*.
 - The first step in producing the plan is **to decide what activities need to be carried out** and in what **order** they are to be done. ----- *creating an activity plan*
 - The ideal activity plan will then be the subject of an *activity risk analysis*, aimed at identifying potential problems.
 - The third step is *resource allocation*.
 - The final step is *schedule production*. Once resources have been allocated to each activity, we will be in a position to draw up and publish a project schedule, which indicates planned start and completion dates and a resource requirement statement for each activity.

Projects and activities: Defining Activities

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- a project is composed of a number of inter-related activities;
- a project may start when at least one of its activities is ready to start;
- a project will be completed when all of the activities it encompasses have been completed;
- an activity must have a clearly defined start and a clearly defined end-point, normally marked by the production of a tangible deliverable;
- if an activity requires a resource (as most do) then that resource requirement must be forecastable and is assumed to be required at a constant level throughout the duration of the activity;
- the duration of an activity must be forecastable – assuming normal circumstances, and the reasonable availability of resources;
- some activities might require that others are completed before they can begin (these are known as *precedence requirements*).

- **Activities must be defined so that they meet these criteria. Any activity that does not meet these criteria must be redefined.**

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Projects and activities: **Identifying Activities**

- Essentially there are three approaches to identifying activities that make up a project.
 - **Activity based Approach**
 - **Product based Approach** ▫
 - Hybrid approach.**

The Activity Based Approach

- Consists of **creating a list of all the activities that the project is thought to involve.**
- Might involve a **brainstorming session involving the whole project team**
- While listing activities for a large project, it might be helpful to **subdivide the project into subtasks** using a Work Breakdown Structure (WBS)



A fragment of an activity-based Work Breakdown Structure.

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The Activity Based Approach

- When preparing a WBS, **consideration must be given to the final level** of detail or **depth of the structure**.

- **Too great depth will result in a large number of small tasks** that will be difficult to manage.
- **Too shallow structure will provide insufficient detail** for project control.
- Each branch should, however, be broken down at least to a level where each leaf may be assigned to an individual or responsible section within the organization.

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The Product Based Approach

- Consists of a Product Breakdown Structure (PBS) and a Product Flow Diagram (PFD).
- The PFD indicates, for each product, **which other products are required as inputs**
- The PFD can easily be transformed into an ordered list of activities.
- Is particularly appropriate for SSADM which clearly specifies, **for each step, each of the products required and the activities required to produce it.**

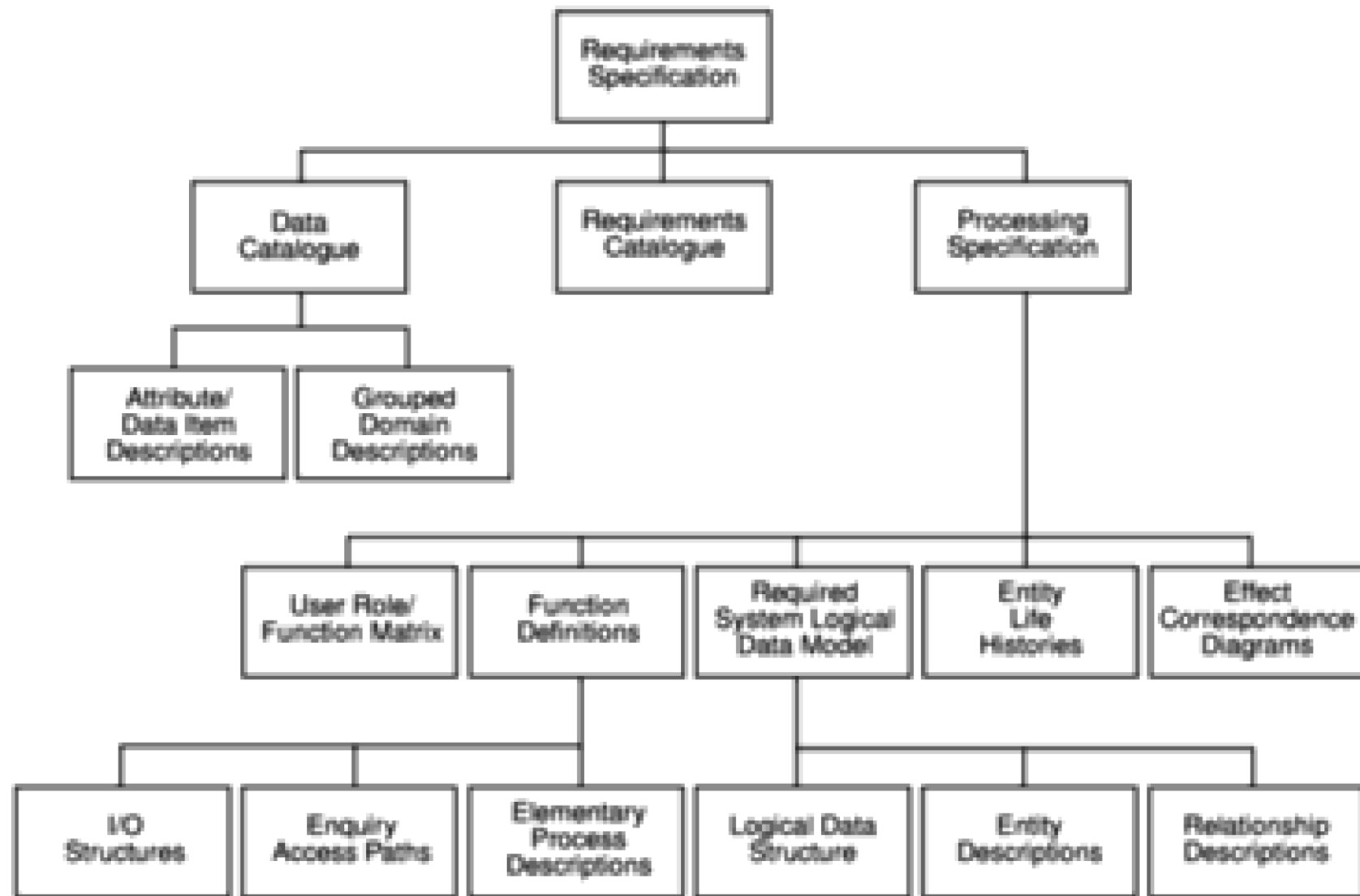


Figure 6.3 *SSADM Product Breakdown Structure for Requirements Specification (adapted from Goodland and Slater).*

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The Hybrid Approach

- IBM recommended 5 levels in WBS
- **Level 1:** Project
- **Level 2:** Deliverables such software, manuals and courses
- **Level 3:** Components which are the key work items needed to produce deliverables such as the modules and tests required to produce the system software
- **Level 4:** Work packages which are major items, or

as
training

a

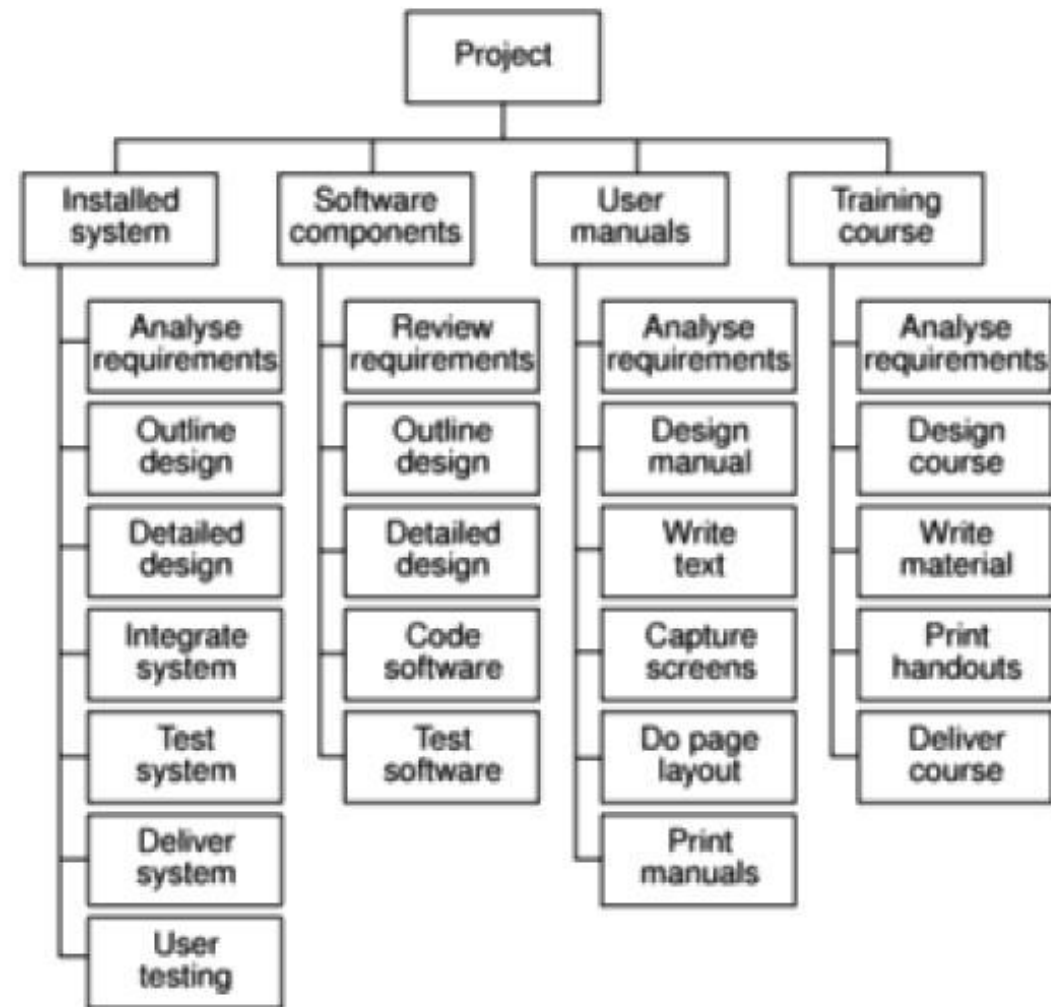


Figure 6.5 A Work Breakdown Structure based on deliverables.

collections of related tasks, required to produce component

- **Level 5:** Tasks which are tasks that will normally be the responsibility of a single person

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Sequencing and Scheduling Activities

- Through out a project, we will require a schedule that clearly indicates when each of the project's activities is planned to occur and what resources it will need.
- On way of presenting such a plan is to use a bar chart.

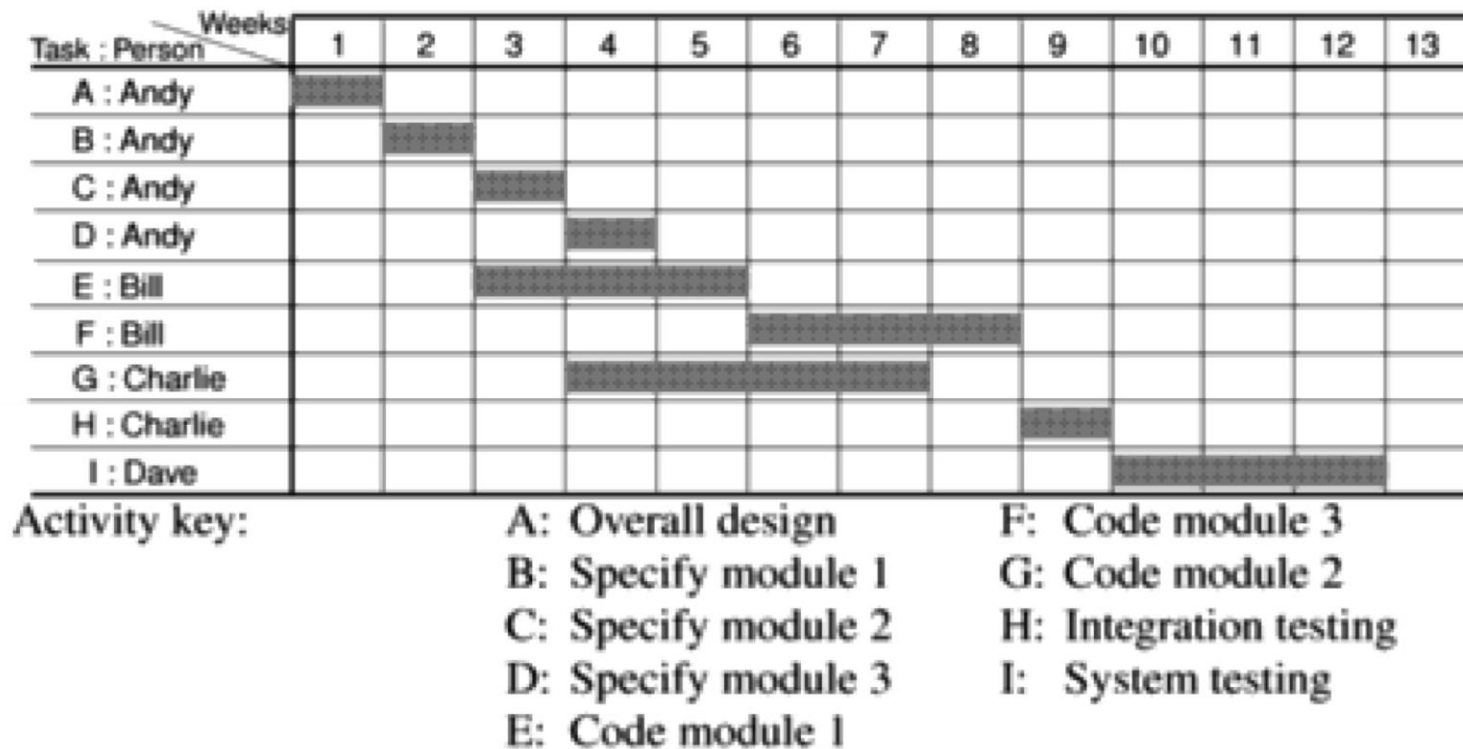


Figure 6.6 A project plan as a bar chart.

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Network Planning Models

- CPM – Critical Path Method

- PERT – Program Evaluation and Review Technique
- **Both CPM and PERT (Program Evaluation and Review Technique) provide the user with project management tools to plan, monitor, and update their project as it progresses.**

Similarities between PERT and CPM

- Both follow the same steps and use network diagrams
- Both are used to plan the scheduling of individual activities that make up a project
- They can be used to determine the earliest/latest start and finish times for each activity

Differences between PERT and CPM

- PERT is probabilistic whereas CPM is deterministic
- In CPM, estimates of activity duration are based on historical data
- In PERT, estimates are uncertain and we talk of ranges of duration and the probability that an activity duration will fall into that range
- In routine projects where estimated time for each activity is known, CPM is a better tool to control both time and cost.

Formulating a Network Model

- The first stage in creating a network model is to **represent the activities and their interrelationships as a graph.**
- **Activity Network Rules and Conventions (Constructing Precedence Network)**
- **A project network should have only one start node:**
 - Although it is logically possible to draw a network with more than one starting node, it is undesirable to do so as it is **a potential source of confusion.**
- **A project network should have only one end node:**
 - The end node designates the completion of the project and a **project may only finish once.**
- **A node has duration:**
 - A node represents an activity and in general, **activities take time to execute.**

Formulating a Network Model

- **Activity Network Rules and Conventions (Constructing Precedence Network)**
- **Links normally have no duration:**
 - Links represent the relationships between activities.
 - In the figure below, neither installation cannot start until program testing is complete.
 - Program testing cannot start until both coding and data take on have been completed.



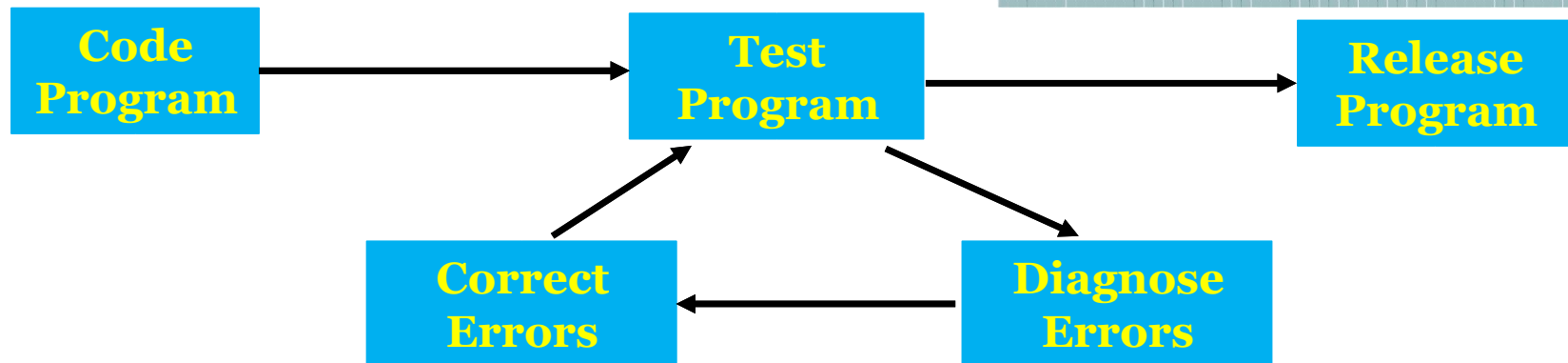
- **Precedents are the immediate preceding activities:**
 - Program Test cannot start until both Code and Data Take-on have been completed
 - Install cannot start until program test has finished.

- Code and Data Take-on can therefore be said to be precedents of Program Test and Program Test is precedent of Install

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Formulating a Network Model

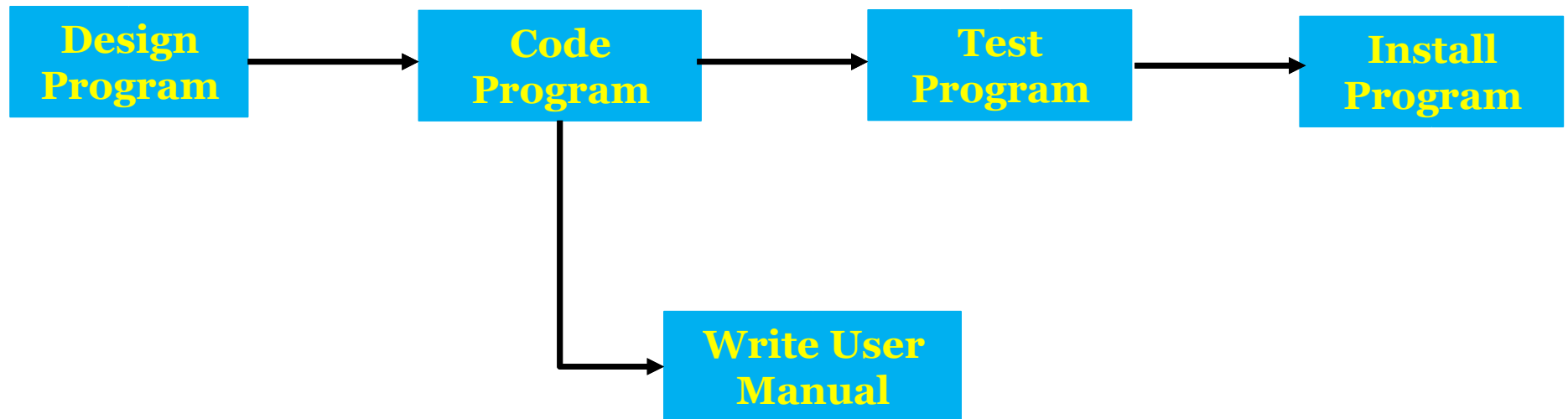
- **Activity Network Rules and Conventions (Constructing Precedence Network)**
- **Time moves from left to right**
 - Networks are drawn so that time moves from left to right.
 - *It is rare that this convention is flouted.*
 - People add arrow heads to the lines to give stronger visual indication of time flow
- **A network may not contain loops**
 - A loop is an error in that it represents a situation that cannot occur in practice



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Formulating a Network Model

- **Activity Network Rules and Conventions (Constructing Precedence Network)**
- **A network should not contain dangles:**
 - A dangling activity write user manual in the figure below should not exist as it is likely to lead to errors in subsequent analysis
 - In many cases dangling activities indicate errors in logic when activities are added as an afterthought.



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Formulating a Network Model

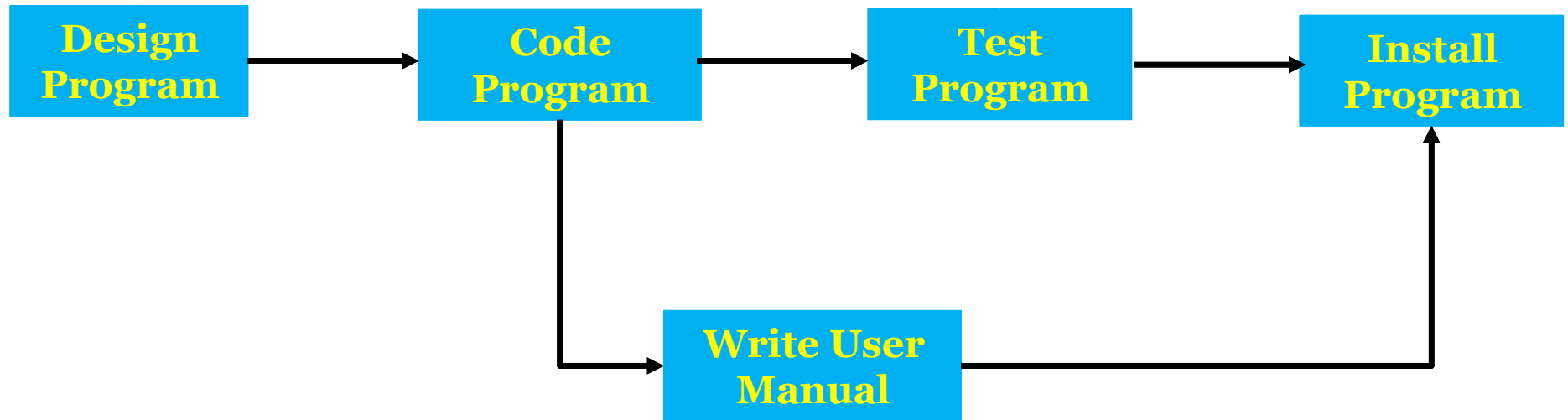


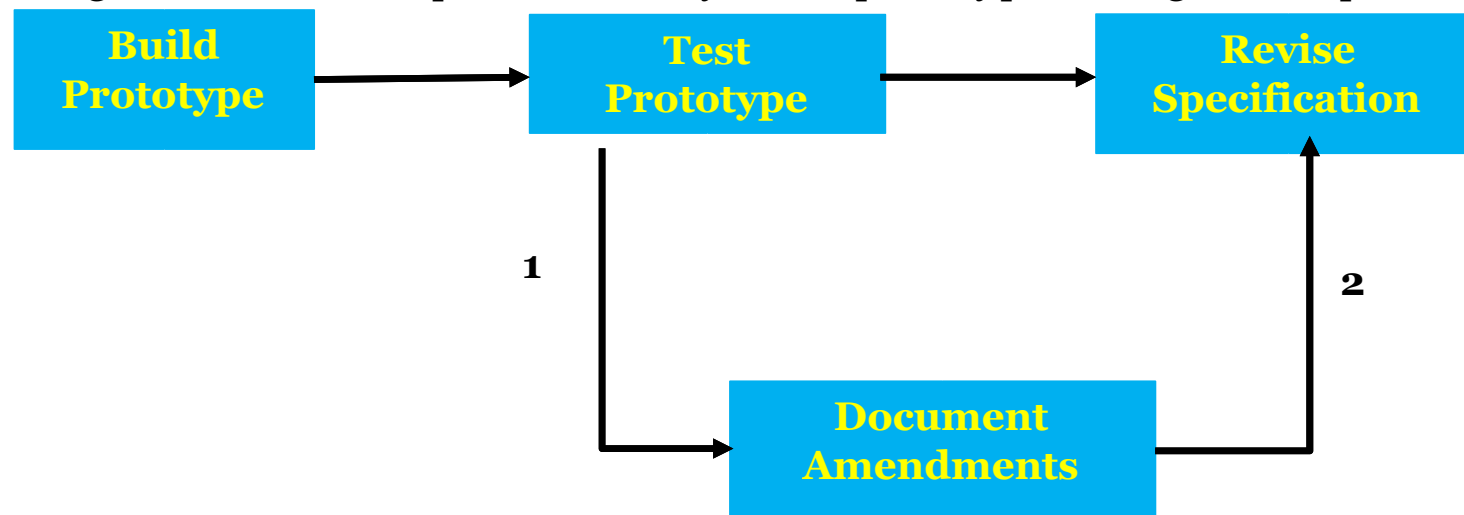
Fig. Resolving a dangle

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Formulating a Network Model

- Activity Network Rules and Conventions (Constructing Precedence Network)
- Representing Lagged Activities:

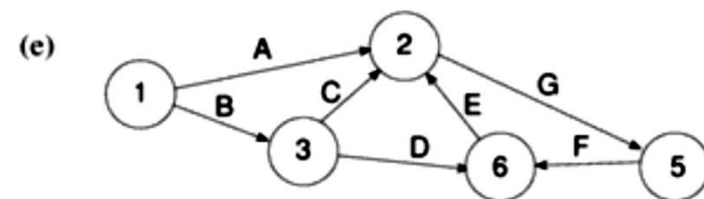
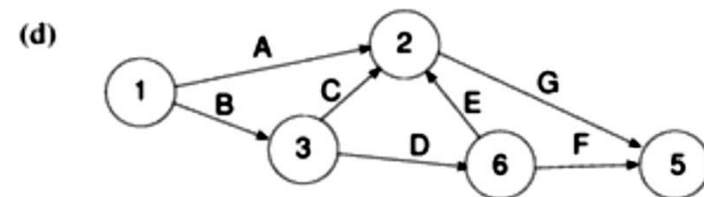
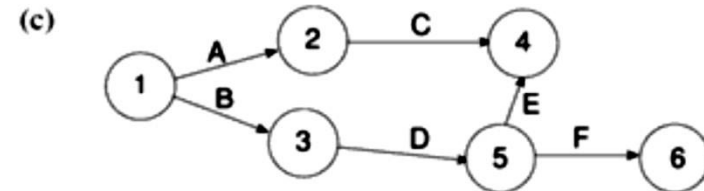
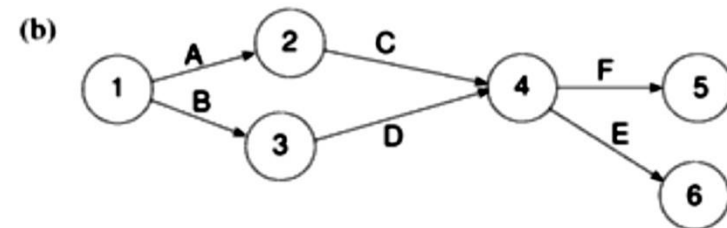
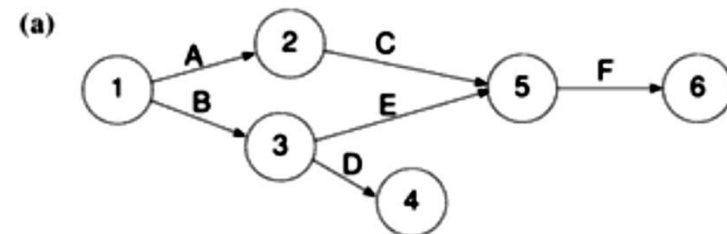
- We might come across situations where we wish to undertake two activities in parallel so long as there is a lag between the two.
- Eg. We would designate an activity “test and document amendments” which would make it impossible to show that amendment recording could start say 1 day after testing has begun and finishing a little after the completion of testing.
- The figure indicates that the document amendments can start one day after the start of prototype testing and will be completed two days after prototype testing is completed.



Formulating a Network Model

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Concept Check

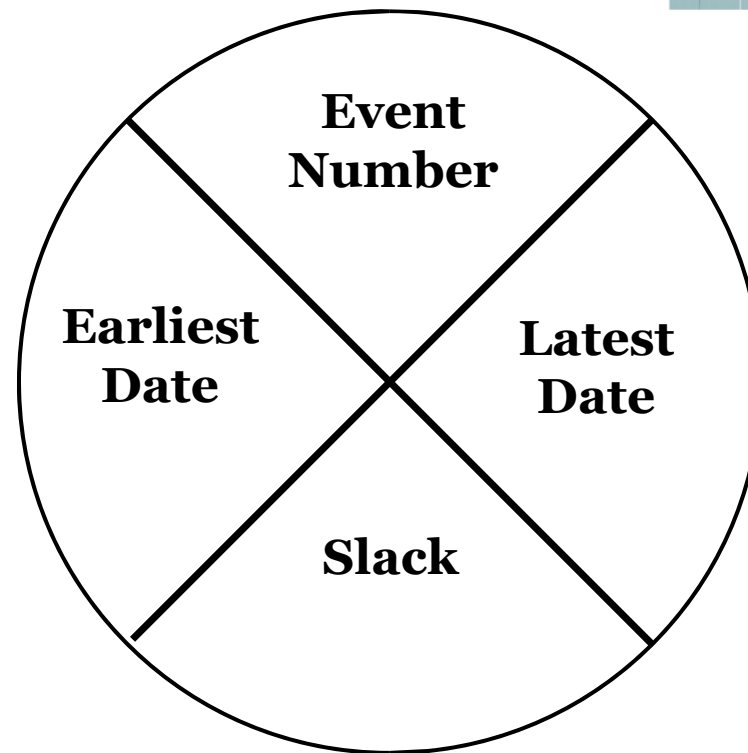


State what is wrong with each of them and redraw where possible.

Answer

Activity Labelling

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The Forward Pass Rule

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- The earliest date for an event is the earliest finish date for all the activities terminating at the event.
- Where more than one activity terminates at a common event we take the latest of the earliest finish dates for those activities.

The Backward Pass Rule

- The latest date for an event is the latest start date for all the activities that may commence from that event.
- Where more than one activity commences at a common event, we take the earliest of the latest start dates for those activities.

Question!!!

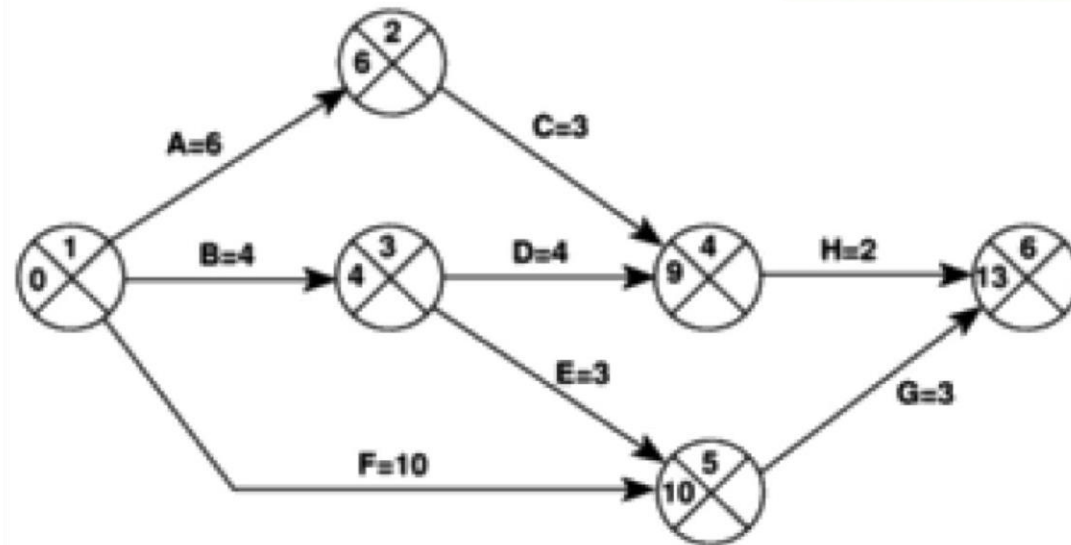
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An example project specification with estimated activity durations and precedence requirements

<i>Activity</i>		<i>Duration (weeks)</i>	<i>Precedents</i>
A	Hardware selection	6	
B	Software design	4	
C	Install hardware	3	A
D	Code & test software	4	B
E	File take-on	3	B
F	Write user manuals	10	
G	User training	3	E, F
H	Install & test system	2	C, D

Solution!!!

A CPM network after forward pass



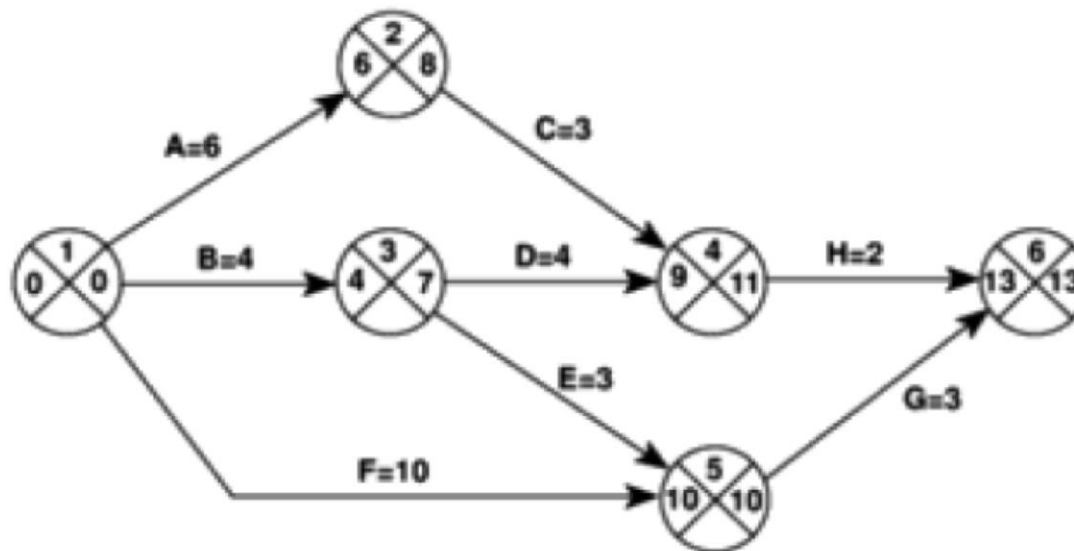
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Table 6.2 The activity table after the forward pass

Activity	Duration (weeks)	Earliest start date	Latest start date	Earliest finish date	Latest finish date	Total float
A	6	0		6		
B	4	0		4		
C	3	6		9		
D	4	4		8		
E	3	4		7		
F	10	0		10		
G	3	10		13		
H	2	9		11		

Solution!!!

A CPM network after backward pass



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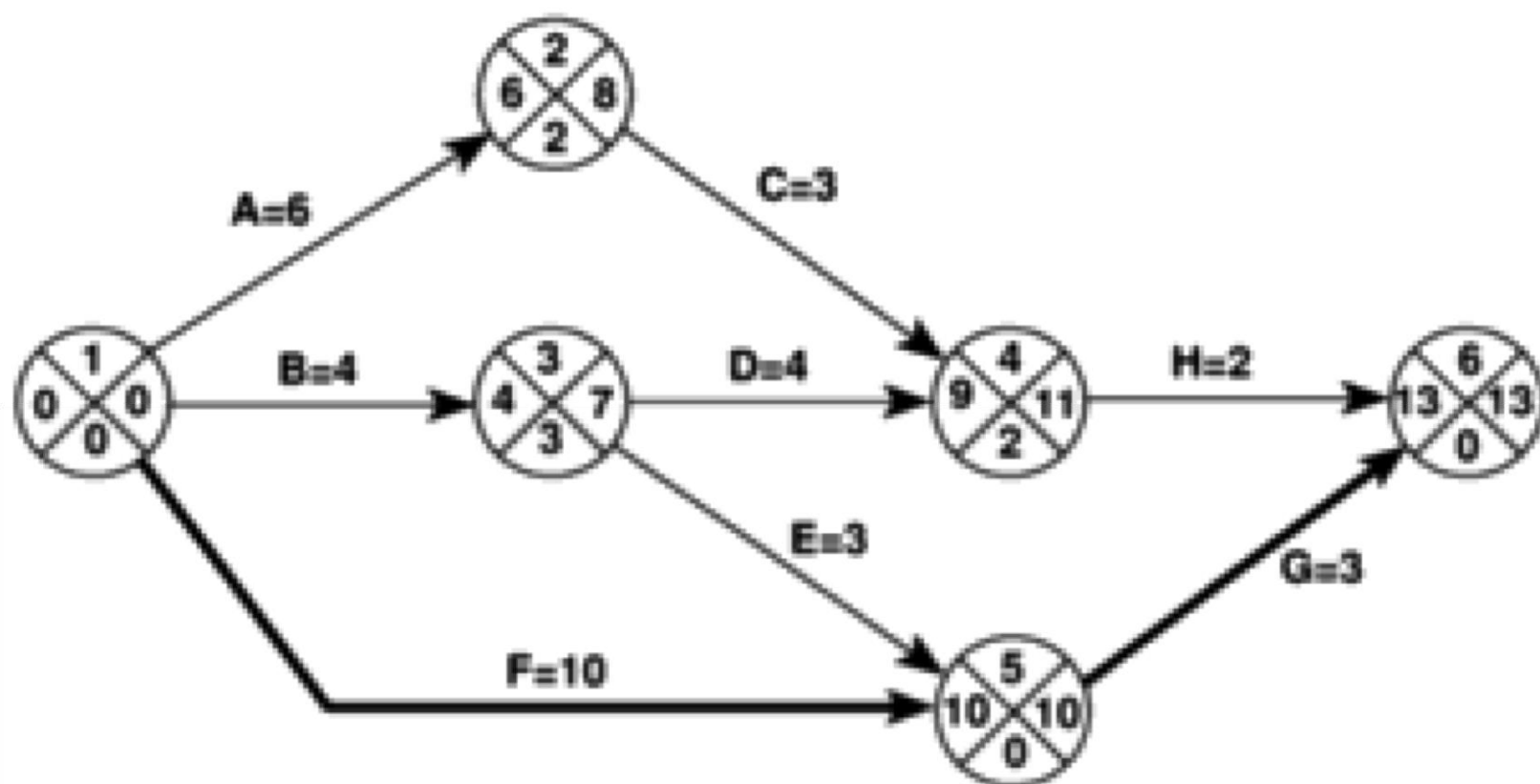
Table 6.3 The activity table following the backward pass

Activity	Duration (weeks)	Earliest start date	Latest start date	Earliest finish date	Latest finish date	Total float
A	6	0	2	6	8	
B	4	0	3	4	7	
C	3	6	8	9	11	
D	4	4	7	8	11	
E	3	4	7	7	10	
F	10	0	0	10	10	
G	3	10	10	13	13	
H	2	9	11	11	13	

Identifying the critical path

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- **Slack** : it is the **difference between the earliest date and the latest date for an event** – it is a measure of how late an event may be without affecting the end date of the project.
- The critical path is the path joining all nodes with a zero slack.



Identifying the critical path

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Table 6.4 *The activity schedule showing total float for each activity*

<i>Activity</i>	<i>Duration (weeks)</i>	<i>Earliest start date</i>	<i>Latest start date</i>	<i>Earliest finish date</i>	<i>Latest finish date</i>	<i>Total float</i>
A	6	0	2	6	8	2
B	4	0	3	4	7	3
C	3	6	8	9	11	2
D	4	4	7	8	11	3
E	3	4	7	7	10	3
F	10	0	0	10	10	0
G	3	10	10	13	13	0
H	2	9	11	11	13	2

1

2

3 >> (5-1)

4 >> (2+1)

5

(5-4)

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Any Queries?