

UNIT-2 : Project Scheduling and Cost Control

Subject: Project Management (RGPV)

1. Project Scheduling

Definition

Project Scheduling is the process of arranging project activities in proper sequence along with time duration and resource allocation to complete the project on time.

Easy Introduction

Suppose you are organizing a college fest.

You cannot do all work together.

First:

- permission
- then stage setup
- then decoration
- then sound system
- then event execution

This proper planning of activities according to time is called **Project Scheduling**.

Why This Topic is Important

In Real Life

Every company uses scheduling for:

- software projects
- construction
- manufacturing
- event management

In Exams

★ Most repeated topic

🔥 Important for long answers

🎯 Frequently asked in RGPV

Detailed Explanation

Project scheduling helps in:

- proper planning
- resource utilization
- time management
- delay reduction
- cost control

It answers:

- What work should be done?
 - When should it start?
 - How much time will it take?
 - Which activity depends on another?
-

Steps in Project Scheduling

Step 1: Identify Activities

List all project activities.

Step 2: Define Sequence

Arrange activities in order.

Step 3: Estimate Time

Calculate duration of each activity.

Step 4: Allocate Resources

Assign workers, machines, money.

Step 5: Prepare Schedule

Make timeline/chart.

Step 6: Monitor Progress

Track project execution.

Flow of Process

Project Planning



Activity Identification



Activity Sequencing



Time Estimation



Resource Allocation



Project Schedule



Monitoring & Control

Diagram

Activities → Sequence → Time → Resources → Schedule

Example

Example: Website Development Project

Activity	Duration
Requirement Analysis	3 days
Design	5 days
Coding	10 days
Testing	4 days
Deployment	2 days

Advantages

- Timely completion
 - Better coordination
 - Resource optimization
 - Delay reduction
 - Cost saving
-

Disadvantages

- Complex for large projects
 - Requires continuous monitoring
 - Time estimation may be inaccurate
-

Applications

- Construction projects
 - Software development
 - Event management
 - Manufacturing industries
-

Important Keywords for Exam

- Scheduling
 - Time management
 - Activity sequencing
 - Resource allocation
 - Project timeline
-

Conclusion

Project scheduling is an important project management activity that helps complete projects systematically within time and budget.

2. PERT (Program Evaluation and Review Technique)

Definition

PERT is a project scheduling technique used for planning and controlling uncertain activities where activity time is not fixed.

Easy Introduction

In many projects, exact completion time is unknown.

Example:

- software development
- research projects
- new product development

In such projects, time may change.

PERT handles this uncertainty.

Why It Is Important

PERT helps:

- estimate project completion time
 - manage uncertainty
 - identify critical activities
 - reduce delays
-

Detailed Explanation

PERT uses **three time estimates**:

Time Type	Meaning
Optimistic Time (T_o)	Minimum time
Most Likely Time (T_m)	Normal expected time
Pessimistic Time (T_p)	Maximum time

Formula of Expected Time

$$T_e = \frac{T_o + 4T_m + T_p}{6}$$

Step-by-Step Working

Step 1: Identify activities

Step 2: Draw network diagram

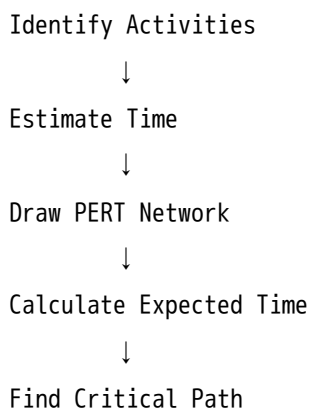
Step 3: Estimate three times

Step 4: Calculate expected time

Step 5: Find critical path

Step 6: Monitor project

Flowchart



Diagram

(1) ----A----> (2) ----B----> (3)

Example

Suppose:

- $T_o = 2$ days
- $T_m = 5$ days
- $T_p = 8$ days

Expected Time:

$$T_e = \frac{2 + 4(5) + 8}{6} = 5 \text{ days} \quad T_e = \frac{2 + 4(5) + 8}{6} = 5 \text{ days}$$

Advantages

- Handles uncertainty
 - Better planning
 - Useful in research projects
 - Improves coordination
-

Disadvantages

- Complex calculations
 - Requires accurate estimates
 - Large network difficult to manage
-

Applications

- Software projects

- Research projects
 - Space projects
 - Defense projects
-

Important Keywords

- Expected Time
 - Probabilistic Model
 - Optimistic Time
 - Pessimistic Time
 - Critical Path
-

Conclusion

PERT is an effective project scheduling tool used where activity duration is uncertain.

3. CPM (Critical Path Method)

Definition

CPM is a project scheduling technique used for projects where activity time is fixed and known.

Easy Introduction

Construction projects usually have fixed time.

Example:

- cement drying time
- painting duration

- road construction

Here time is predictable.

CPM is used for such projects.

Why It Is Important

CPM helps:

- identify longest path
 - reduce project delays
 - control project cost
 - optimize resources
-

Detailed Explanation

CPM focuses on:

- time optimization
- cost optimization
- critical activities

Activities on critical path cannot be delayed.

Step-by-Step Working

Step 1: Identify activities

Step 2: Define sequence

Step 3: Estimate fixed time

Step 4: Draw network

Step 5: Find critical path

Step 6: Calculate float

Diagram

Start → A → B → C → End

Critical Path

Critical path = longest path in project network.

Activities on critical path have:

- zero float
 - no delay allowed
-

Example

Activity	Duration
A	3
B	5
C	2

Critical Path = A → B → C

Total Time = 10 days

Advantages

- Easy scheduling
 - Better project control
 - Time optimization
 - Cost reduction
-

Disadvantages

- Not suitable for uncertain projects
 - Complex for large projects
-

Applications

- Construction
 - Manufacturing
 - Production planning
-

Important Keywords

- Critical Path
 - Deterministic Model
 - Float
 - Network Diagram
-

Conclusion

CPM is widely used for planning and controlling projects with fixed activity times.

4. Difference Between PERT and CPM

Basis	PERT	CPM
Full Form	Program Evaluation Review Technique	Critical Path Method
Nature	Probabilistic	Deterministic
Time	Uncertain	Fixed
Used In	Research projects	Construction projects
Focus	Time planning	Time & Cost optimization
Estimates	Three time estimates	Single time estimate
Complexity	More complex	Simpler

Memory Trick

“PERT = Probability”

“CPM = Cost Planning Method”

5. Critical Path Calculation

Definition

Critical Path is the longest path in a project network that determines minimum project completion time.

Easy Introduction

Suppose some activities are very important.

If they get delayed, whole project gets delayed.

These activities form critical path.

Steps for Critical Path Calculation

Forward Pass

Calculate earliest start and finish.

Backward Pass

Calculate latest start and finish.

Float Calculation

Float = slack time available.

Identify Critical Path

Activities with zero float.

Formula

$\text{Float} = \text{LS} - \text{ES} = \text{LF} - \text{EF}$

Diagram

A → B → D
 \ ↑
 → C ---

Advantages

- Identifies important activities
 - Improves monitoring
 - Prevents delay
-

Important Keywords

- Earliest Start (ES)
 - Latest Start (LS)
 - Float
 - Slack
 - Critical Activity
-

6. Precedence Relationship

Definition

Precedence Relationship defines dependency between activities in a project.

Types of Precedence Relationships

Type	Meaning
Finish to Start (FS)	First activity must finish before second starts
Start to Start (SS)	Both activities start together
Finish to Finish (FF)	Both activities finish together
Start to Finish (SF)	Rare relationship

Diagram

A Finish → B Start

Example

Coding must finish before testing starts.

Advantages

- Proper sequence management
 - Avoids confusion
 - Improves coordination
-

7. Float Calculation and Importance

Definition

Float is the amount of extra time available for an activity without delaying the project.

Formula

$\text{Float} = \text{LS} - \text{ES}$

Types of Float

Type	Meaning
Total Float	Total delay allowed
Free Float	Delay without affecting next activity

Importance

- Helps in scheduling flexibility
 - Better resource allocation
 - Delay management
-

Example

If activity can start between day 3 and day 5:

Float = 2 days

8. Crashing of Activity

Definition

Crashing is the process of reducing project duration by adding extra resources at minimum additional cost.

Easy Introduction

Suppose project deadline is near.

Company may:

- hire extra workers
- use extra machines
- increase working hours

This reduces time.

This process is called crashing.

Steps of Crashing

1. Identify critical path
2. Select activity with minimum crash cost
3. Add resources
4. Reduce activity duration

5. Recalculate project duration

Diagram

Normal Time → Add Resources → Reduced Time

Advantages

- Faster project completion
 - Delay reduction
 - Better customer satisfaction
-

Disadvantages

- Increased cost
 - Worker stress
 - Resource overload
-

Applications

- Emergency projects
 - Construction
 - Software deadlines
-

9. Project Cost Control (PERT/Cost)

Definition

Project Cost Control is the process of monitoring and controlling project expenses to keep project within budget.

Steps

1. Estimate project cost
 2. Prepare budget
 3. Track expenses
 4. Compare actual vs planned cost
 5. Take corrective action
-

Diagram

Budget → Monitoring → Comparison → Correction

Advantages

- Prevents overspending
 - Better financial management
 - Increases profitability
-

10. Resource Scheduling & Resource Leveling

Resource Scheduling Definition

Allocating resources to activities according to project schedule.

Resource Leveling Definition

Balancing resource usage to avoid overload or underutilization.

Example

If one worker assigned to 5 tasks at same time:

- workload imbalance occurs

Resource leveling solves this issue.

Diagram

Resources → Allocation → Balancing → Smooth Workload

Advantages

- Efficient resource use
 - Better workload balance
 - Reduced delays
-



MOST IMPORTANT TOPICS

1. PERT ★★★★★
2. CPM ★★★★★
3. Critical Path ★★★★★
4. Float Calculation ★★★★★
5. Crashing ★★★★★

★ MOST IMPORTANT 7-MARK QUESTIONS

1. Explain PERT with example.
 2. Explain CPM with network diagram.
 3. Differentiate between PERT and CPM.
 4. Explain float and its importance.
 5. Explain precedence relationships.
 6. Explain crashing of activities.
 7. Explain resource leveling.
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★ MOST IMPORTANT 14-MARK QUESTIONS

1. Explain PERT and CPM in detail.
 2. Explain critical path calculation with example.
 3. Explain crashing with advantages and disadvantages.
 4. Explain project scheduling techniques.
 5. Explain project cost control and resource leveling.
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🎯 PYQ-BASED EXPECTED QUESTIONS

★ Very High Probability

- ✓ PERT
- ✓ CPM

- ✓ Difference between PERT and CPM
 - ✓ Critical Path
-

★ High Probability

- ✓ Float Calculation
 - ✓ Crashing
 - ✓ Resource Leveling
-

★ Medium Probability

- ✓ Precedence Relationship
 - ✓ PERT/Cost
-

⚡ ONE-NIGHT REVISION NOTES

Topic	Keyword
PERT	Uncertain Time
CPM	Fixed Time
Float	Extra Time
Critical Path	Longest Path
Crashing	Reduce Time

MEMORY TRICKS

PERT

“P = Probability”

CPM

“C = Cost Control”

Float

“Float means Free Time”



SMART STUDY PLAN

2-Hour Revision Strategy

Time	Topic
30 min	PERT
30 min	CPM
20 min	Critical Path
20 min	Float
20 min	Crashing + Resource Leveling

5-Hour Preparation Strategy

Hour	Study
1	Project Scheduling
2	PERT
3	CPM
4	Critical Path + Float
5	Crashing + Revision



TOPPER ANSWER WRITING TIPS

How to Score Maximum Marks

1. Always Draw Network Diagram

Even small diagram increases marks.

2. Write Formula Clearly

Like:

$$\text{Float} = \text{LS} - \text{ES} \quad \text{Float} = \text{LS} - \text{ES} \quad \text{Float} = \text{LS} - \text{ES}$$

3. Underline Keywords

Underline:

- Critical Path
 - Float
 - Scheduling
 - Resource Leveling
 - Crashing
-

4. Use Tables

PERT vs CPM table is highly scoring.

5. Write Advantages + Conclusion

Always end answer with proper conclusion.