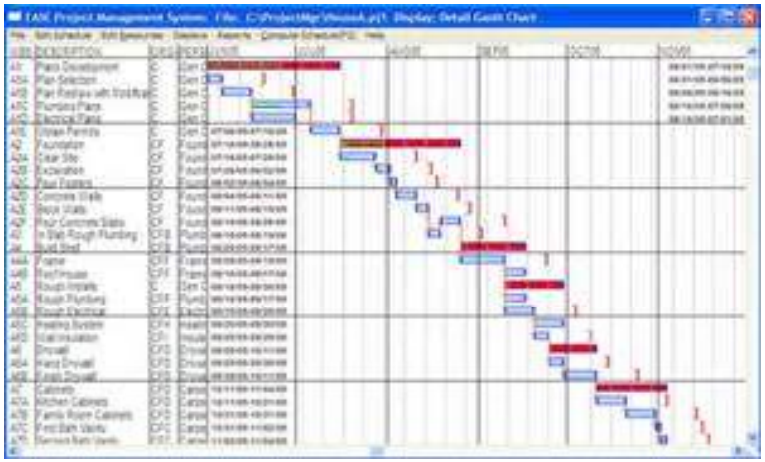
PROJECT PLANNING & SCHEDULING USING PERT/CPM



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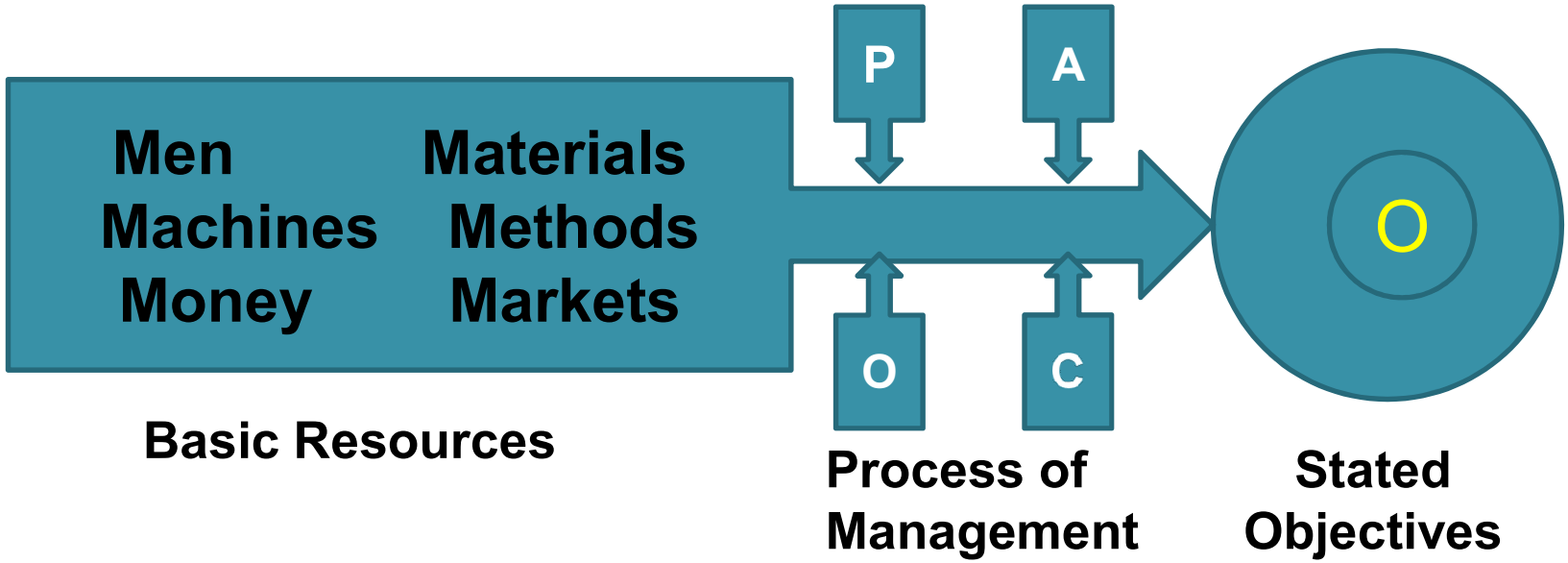
SRINAGAR

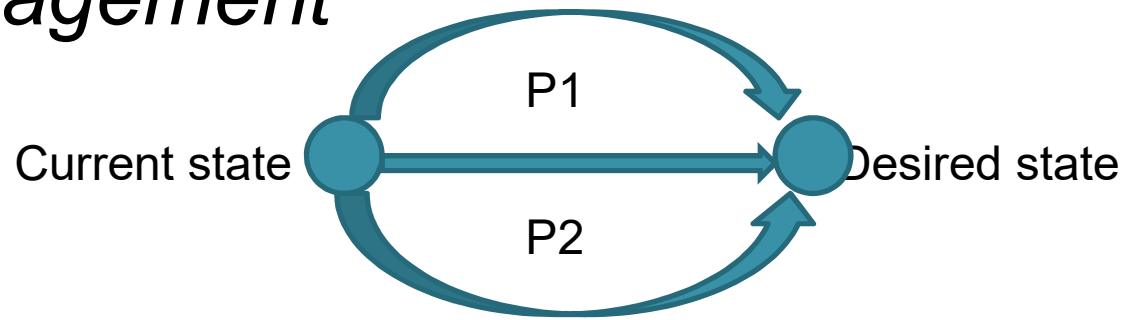
MANAGEMENT


Men
Machines
Money
Materials
Methods
Markets
P
A
O
C
O
Basic Resources
Process of Management
Stated Objectives

WHAT IS A PROJECT?

- A unique set of co-ordinated activities, with defined starting and finishing points, to meet specific objectives within defined **schedule, cost and performance** parameters

-BS 6079- Guide to project management



Agent of Change **Pk**

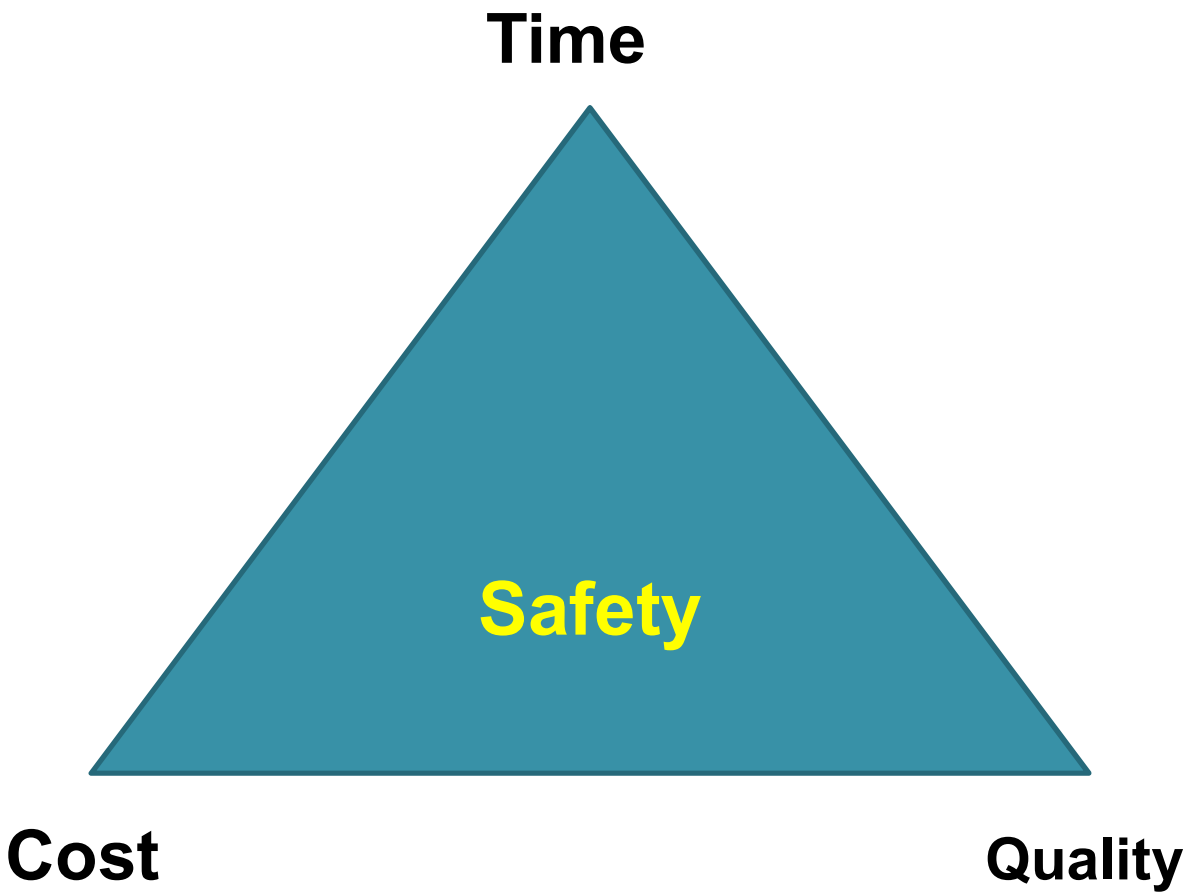
WHAT IS PROJECT MGT.

- The application of processes, methods, knowledge, skills and experience to achieve the project objectives

PROJECT MANAGEMENT

- "***Trying to manage a project without project management is like trying to play a football game without a game plan".***

PROJECT TRIANGLE



OBJECTIVES OF PM

- **Plan** the project ahead of time to foresee possible sources of troubles and delays in completion
- **Schedule** activities at appropriate time to confirm the proper job sequence to complete project as soon as possible
- **Coordinate & control** the project activities so as to stay on schedule in completing the project

Benefits of Project Management

- Better scheduling and budgeting
- Better cost containment
- Better communication throughout project including process mapping and progress reporting
- Better quality planning, quality assurance processes, and quality acceptance steps

- Less rework
- Better definition of work requirements
- Better understanding of roles and responsibilities
- Improved productivity of work
- Earlier attention paid to "red flags" - project problems that may be indicators of more trouble to come

PROJECT EXAMPLES

- Construction of a buildings, highways, & other civil works
- Planning & launching a new product
- Scheduling ship construction & repair
- Conducting market survey for demand forecasting

Project Examples

- Manufacturing and assembly of a large appliance or product
- National literacy drive
- Nation-wide polio eradication
- Rural electrification
- Urban drainage and relief system

PROJECT LIFE CYCLE

1. Project Selection

- Identification
- Screening
- Appraisal (Market, technical, financial, economic, & ecological)

2. Project Planning

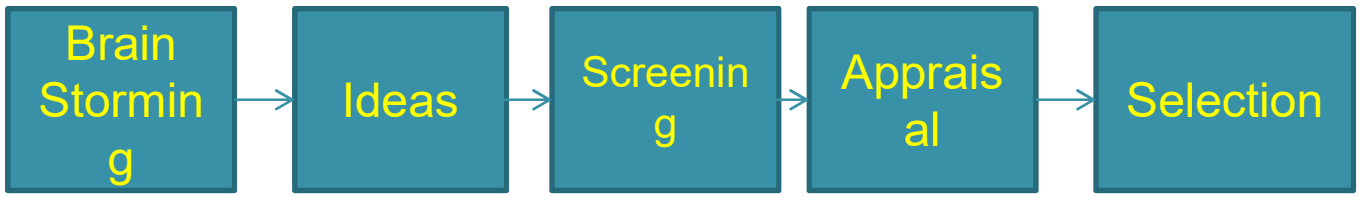
- WBS
- Network development
- Basic Scheduling
- Trade-off
- Resource Scheduling

3.Project Implementation

- Monitoring and control

4.Project completion and auditing

•Need
•Resources
•SWOT



Birth (selection) of a project

PLANNING & SCHEDULING TECHNIQUES

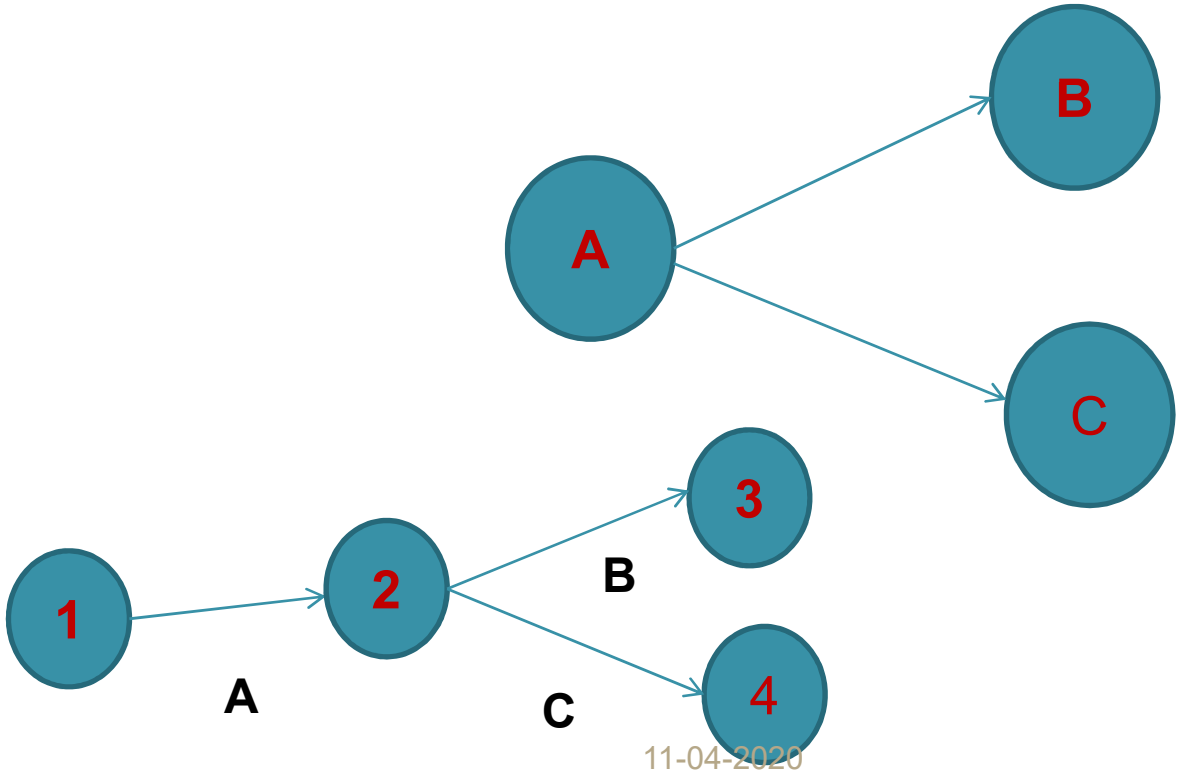
❖ **CPM**- **C**ritical **P**ath **M**ethod

- Discovered by M.R.Walker of E.I.Du Pont de Nemours & Co. and J.E.Kelly of Remington Rand, circa 1957
- The first test was made in 1958, when CPM was applied to the construction of a new chemical plant.
- In March 1959, CPM was applied to maintenance shut-down at the Du Pont works in Louisville, Kentucky. Unproductive time was reduced from 125 to 93 hours.

- **PERT- Program Evaluation and Review Technique.**
- Devised in 1958 for the POLARIS missile program by the Program Evaluation Branch of the Special Projects office of the U.S. Navy, helped by the Lockheed Missile Systems division and the Consultant firm of Booz-Allen & Hamilton.

PROJECT REPRESENTATION & BASIC SCHEDULING

- GANTT CHARTS
- NETWORK DIAGRAMS
  - AON representation
  - AOA representation

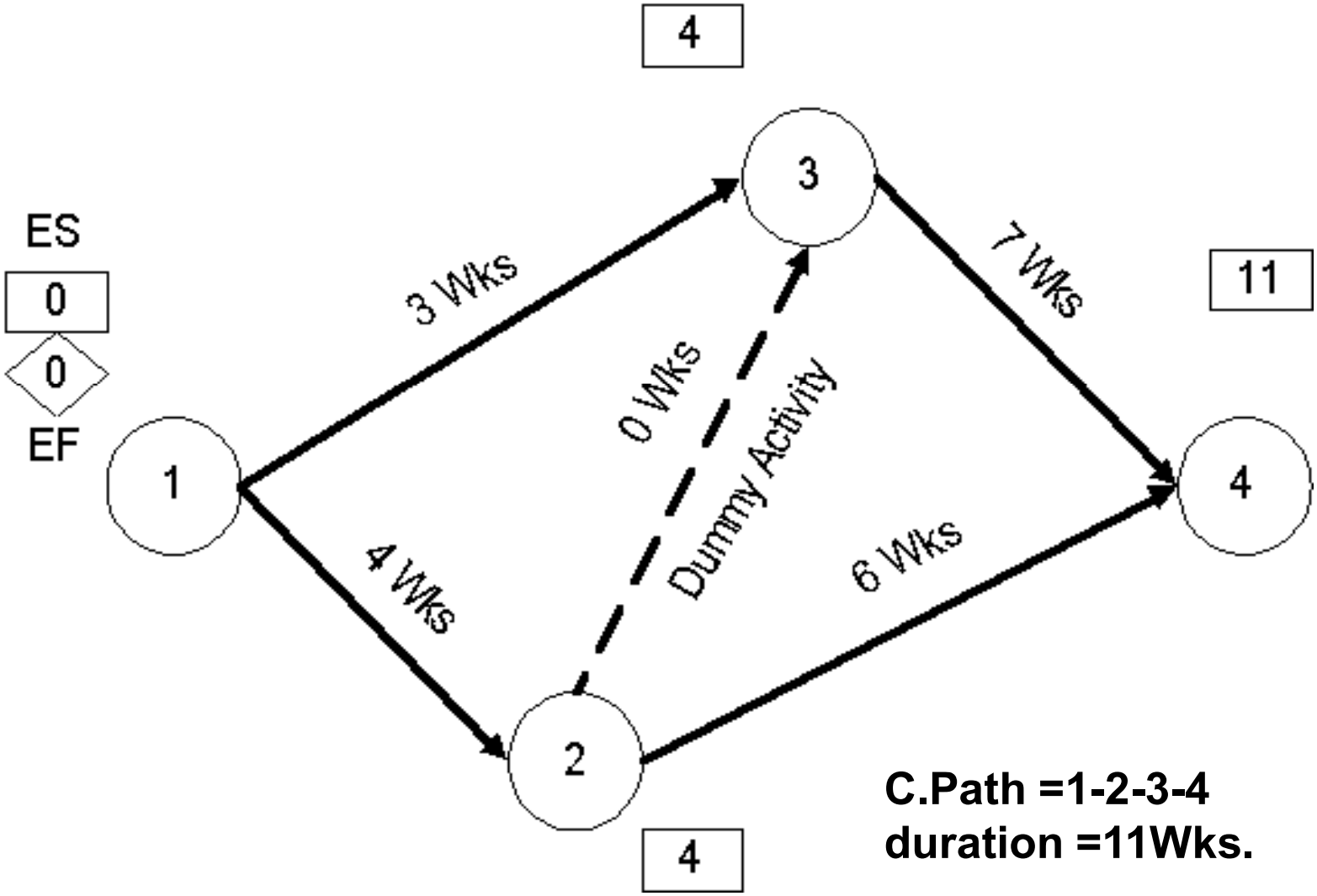


CRITICAL PATH

- *"A project without a critical path is like a ship without a rudder".*

  (D. Meyer, *Illinois Construction Law)*

NETWORK DIAGRAM

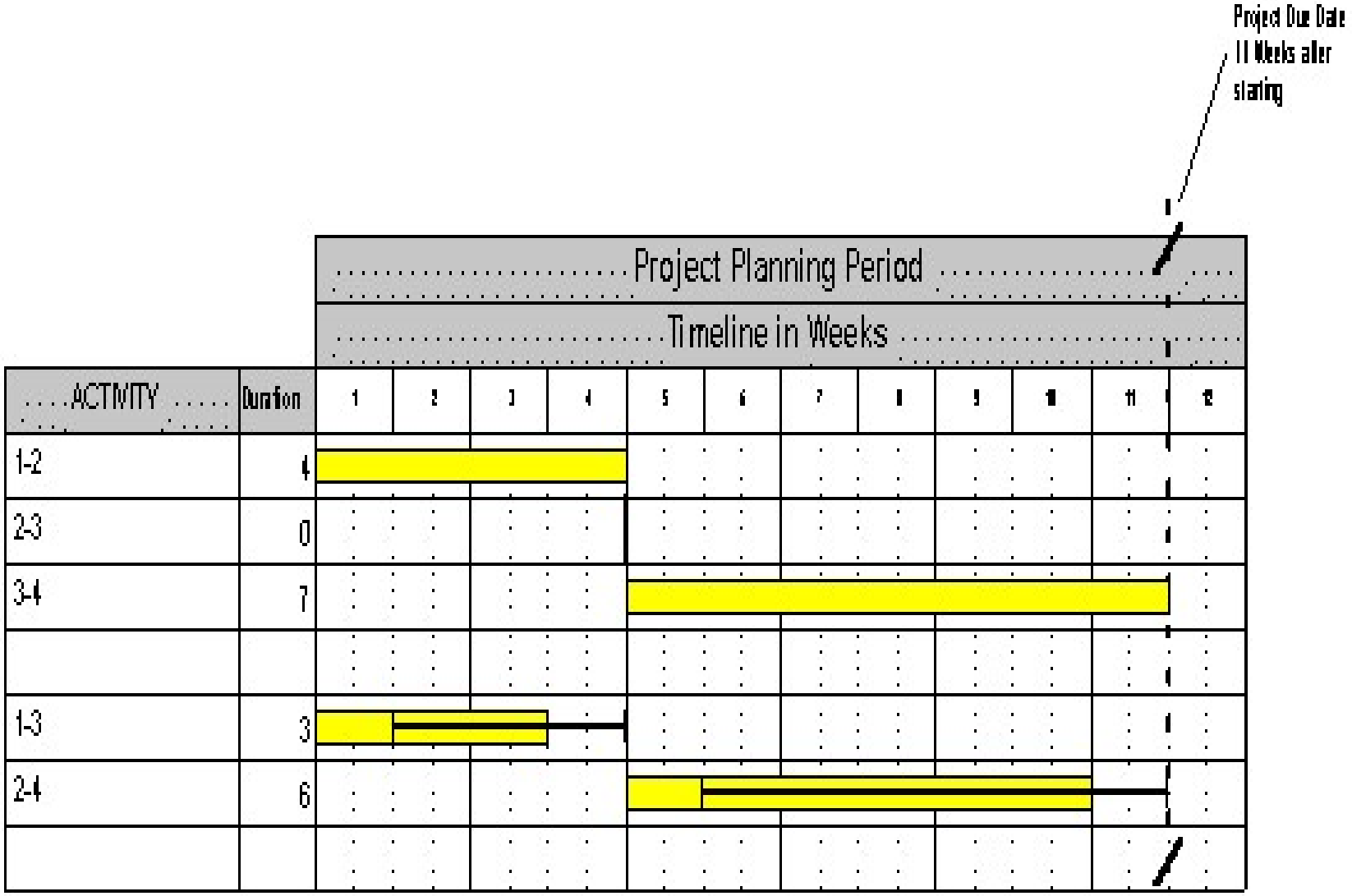


C.Path =1-2-3-4
duration =11Wks.

TIME SCHEDULING

Event	Duration (Weeks)	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Total Float
1-2	4	0	4	0	4	0
2-3	0	4	4	4	4	0
3-4	7	4	11	4	11	0
1-3	3	0	3	1	4	1
2-4	6	4	10	5	11	1

Gantt Chart


Project Due Date
11 Weeks after
starting
Project Planning Period
Timeline in Weeks
ACTIVITY
Duration
1
2
3
4
5
6
7
8
9
10
11
12
1-2
4
2-3
0
3-4
7
1-3
3
2-4
6

Concept of Floats

- **Total Float** : LS – ES or LF – EF
- **Free Float**: ESj –ESi –Tij
- **Independent Float**: ESj – LFi – Tij

PROBABILISTIC MODEL

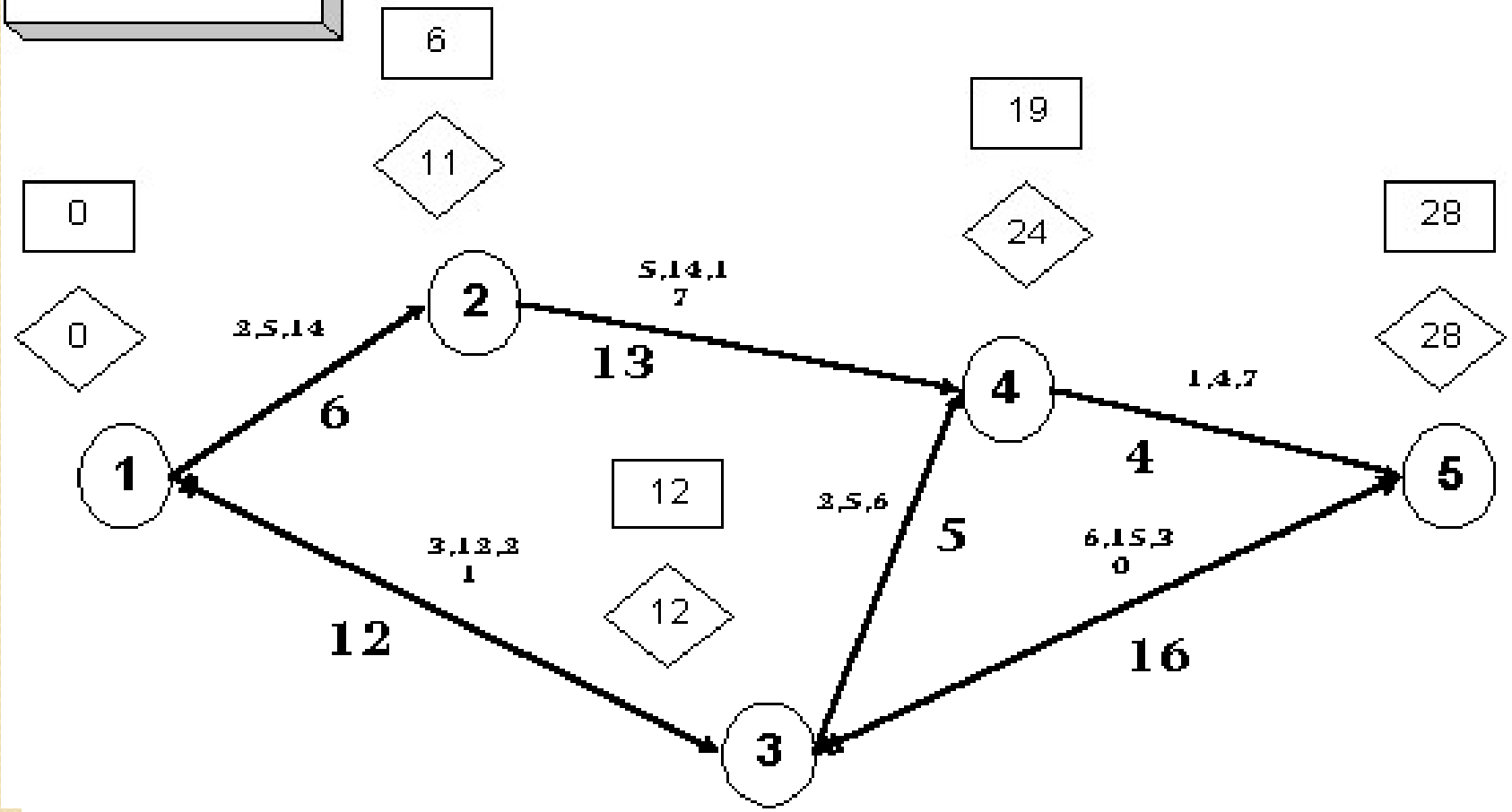
Example :Social Project (Unknown Activities Duration)

Activity -id	Activity - Description	Three time estimations (weeks)
1-2	Social Work Team to live in Village	2, 5, 14
1-3	Social Research Team to do survey	3, 12, 21
3-4	Analyse results of survey	2, 5, 8
2-4	Establish Mother & Child Health Program	5, 14, 17
3-5	Establish Rural Credit Programme	6 ,15, 30
4-5	Carry out Immunisation of Under Fives	1, 4, 7

PERT NETWORK

PERT FORMULA

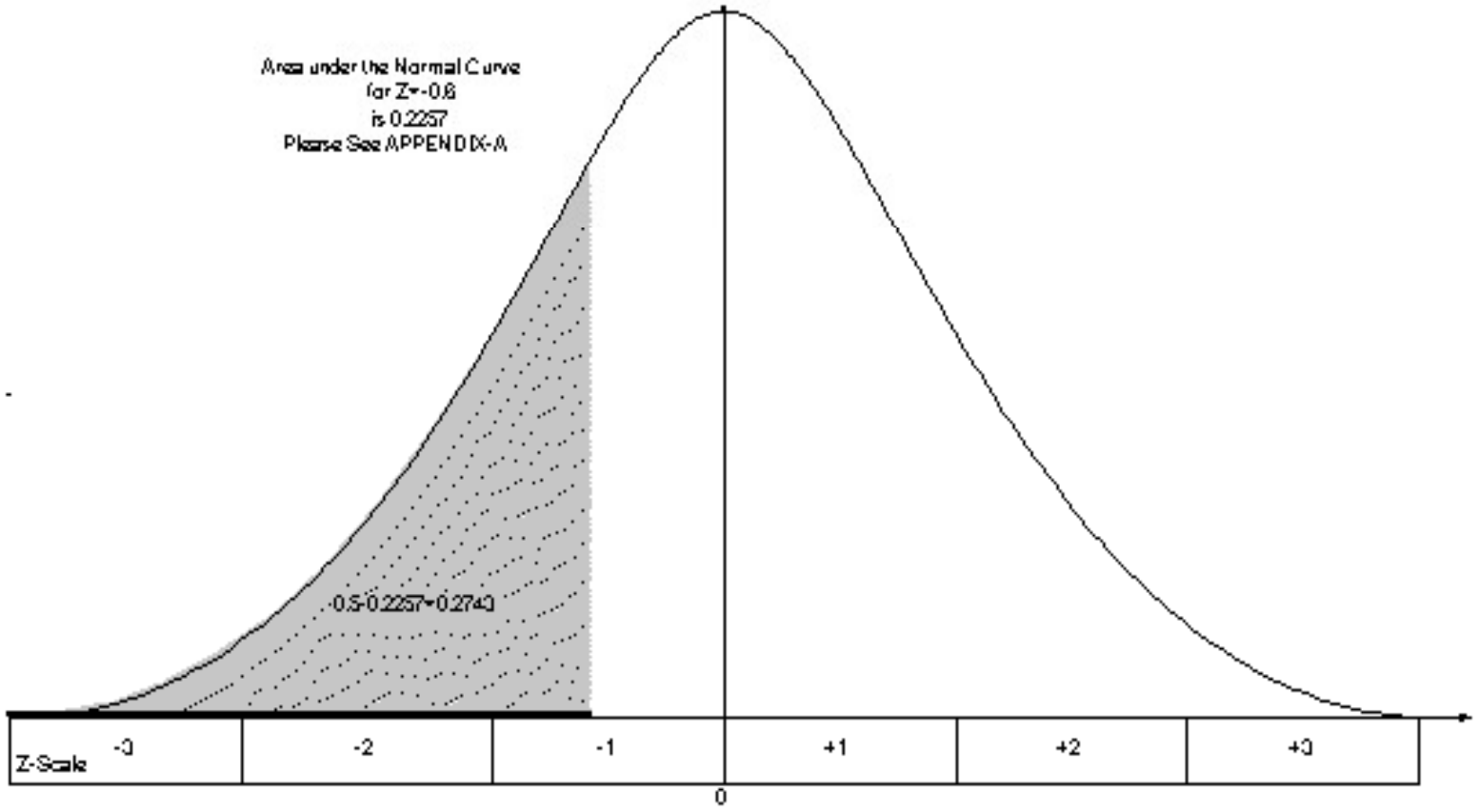
$$t_e = \frac{t_o + 4t_m + t_p}{6}$$



Event	t_o	t_m	t_p	t_e	ES	EF	LS	LF	TF	s.d.	Var
1-3	3	12	21	12	0	12	0	12	0	3	9
3-5	6	15	30	16	12	28	12	28	0	4	16
1-2	2	5	14	6	0	6	5	11	5	2	4
2-4	5	14	17	13	6	19	11	24	5	2	4
3-4	2	5	8	5	12	17	19	24	7	1	1
4-5	1	4	7	4	19	23	24	28	5	1	1

Probability of Project Completion by Due Date

$$Z = \frac{D - t_e}{S_t} = \frac{25 - 28}{5} = \frac{-3}{5} = -0.6$$



Likeliness of project completion in due date

- CRITICAL PATH, 1-3-5 = (12 + 16) = 28

- $\sum \sigma^2 = 9 + 16 = 25$

- $Z = \frac{D - Te}{\sigma} = \frac{25 - 28}{5} = -0.6$

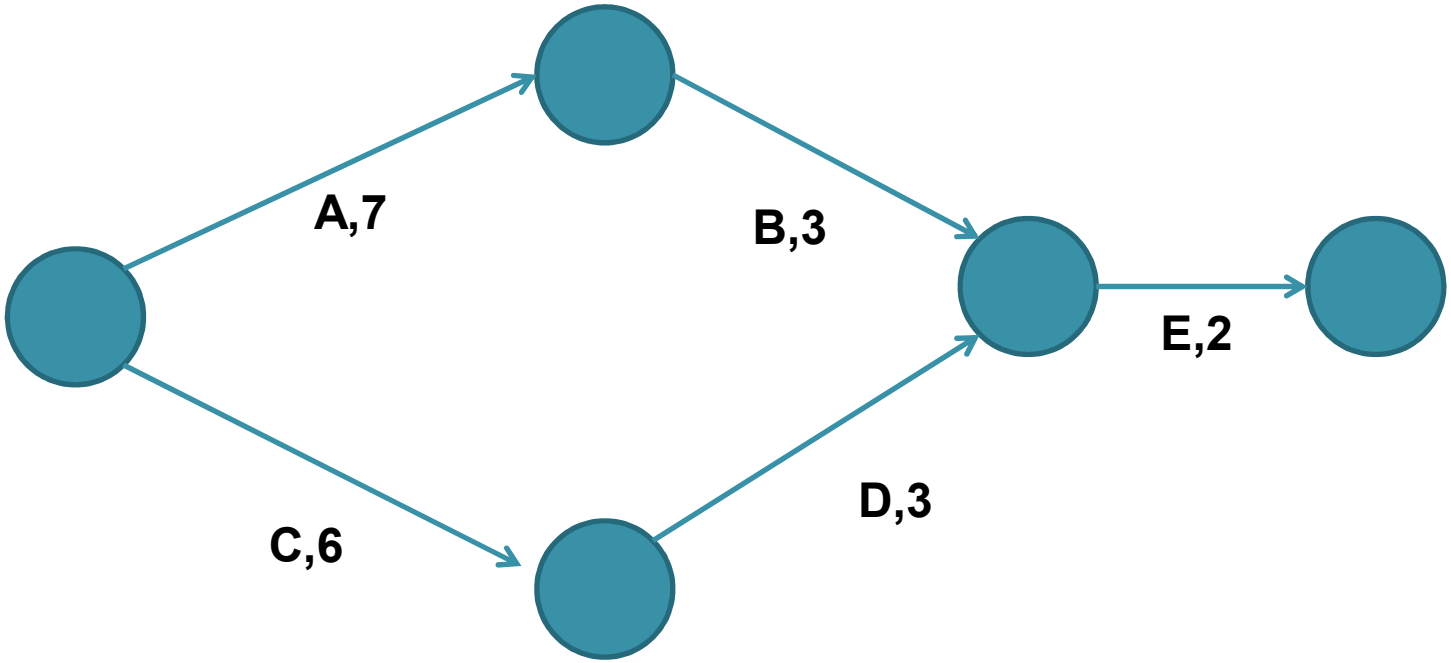
From Normal distribution table

Probability that the project will be completed in 28 weeks = 0.274

PROJECT CRASHING

PROJECT CRASHING

Act.	N_t	C_t	N_c	C_c	ΔT	ΔC	$S=\frac{\Delta C}{\Delta T}$
A	7	4	500	800	3	300	100
B	3	2	200	350	1	150	150
C	6	4	500	900	2	400	200
D	3	1	200	500	2	300	150
E	2	1	300	550	1	250	250


A,7
B,3
E,2
C,6
D,3

Crashing procedure

Paths	A	B	C	D	E	C.P	C1	C2	C3	C4
ABE	100	150	-	-	250	12	11	10	8	7
CDE	-	-	200	150	250	11	11	10	8	7
∆T	3	1	2	2	1					
∆T1	2	1	2	2	1					
∆T2	2	1	2	2	-					
∆T3	-	-	-	1	-					

NETWORK SCHEDULING WITH LIMITED RESOURCES

Heuristic programs for resource scheduling

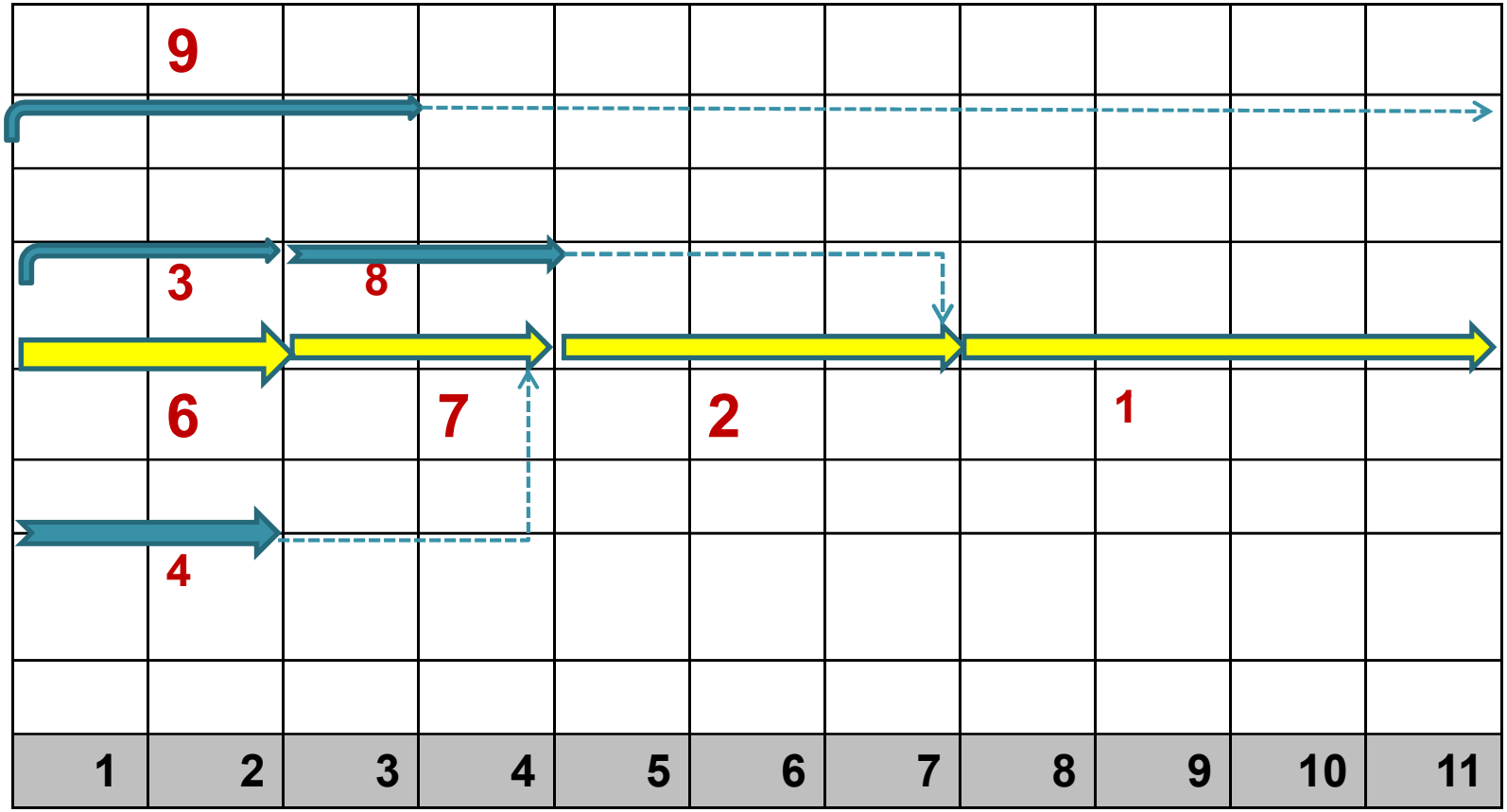
- RESOURCE LEVELING PROGRAMS

Reduce peak resources requirements and smooth out period to period assignments within the constraint on project duration

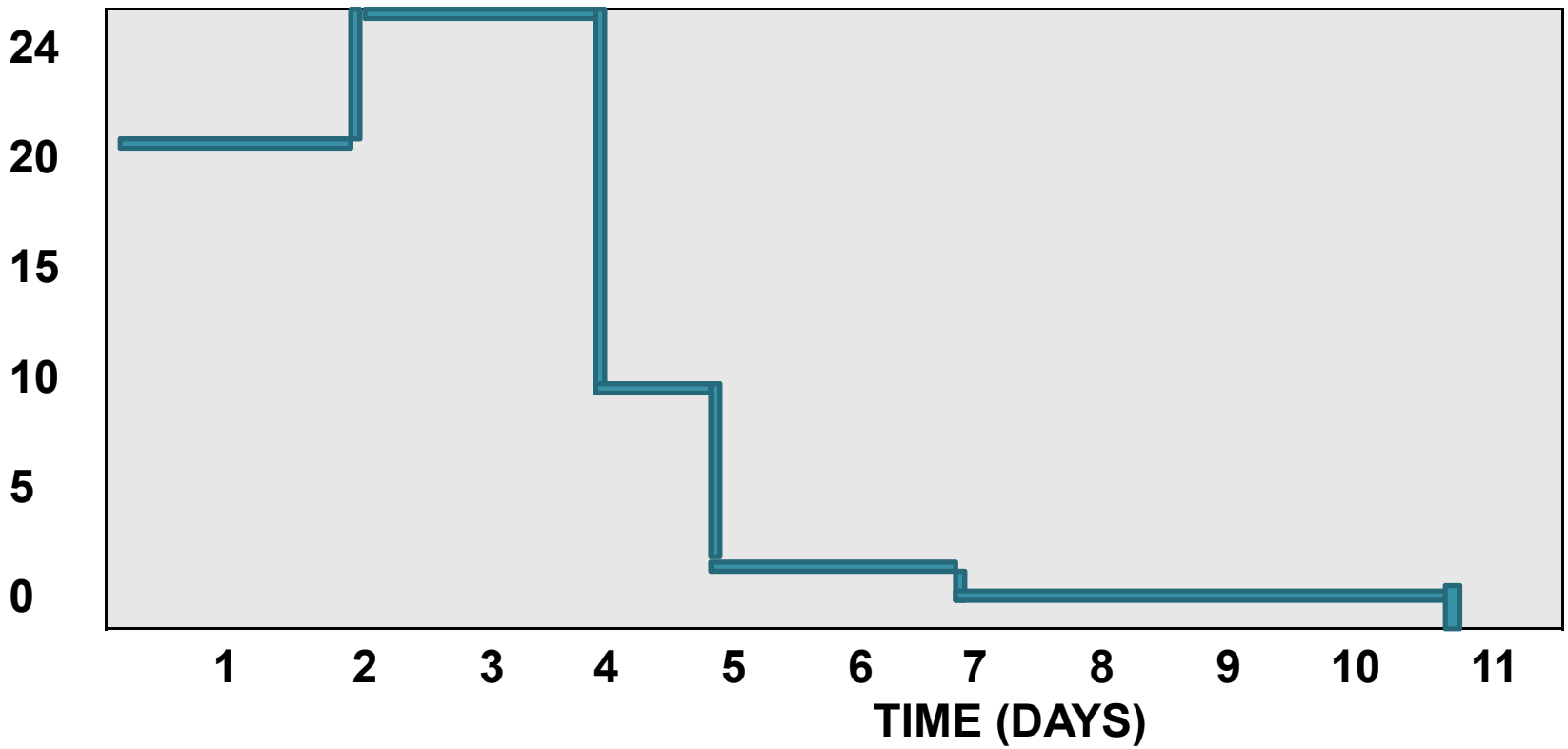
- RESOURCE ALLOCTION PROGRAMS

Allocate available resources to find the shortest project schedule consistent with fixed resource limits.

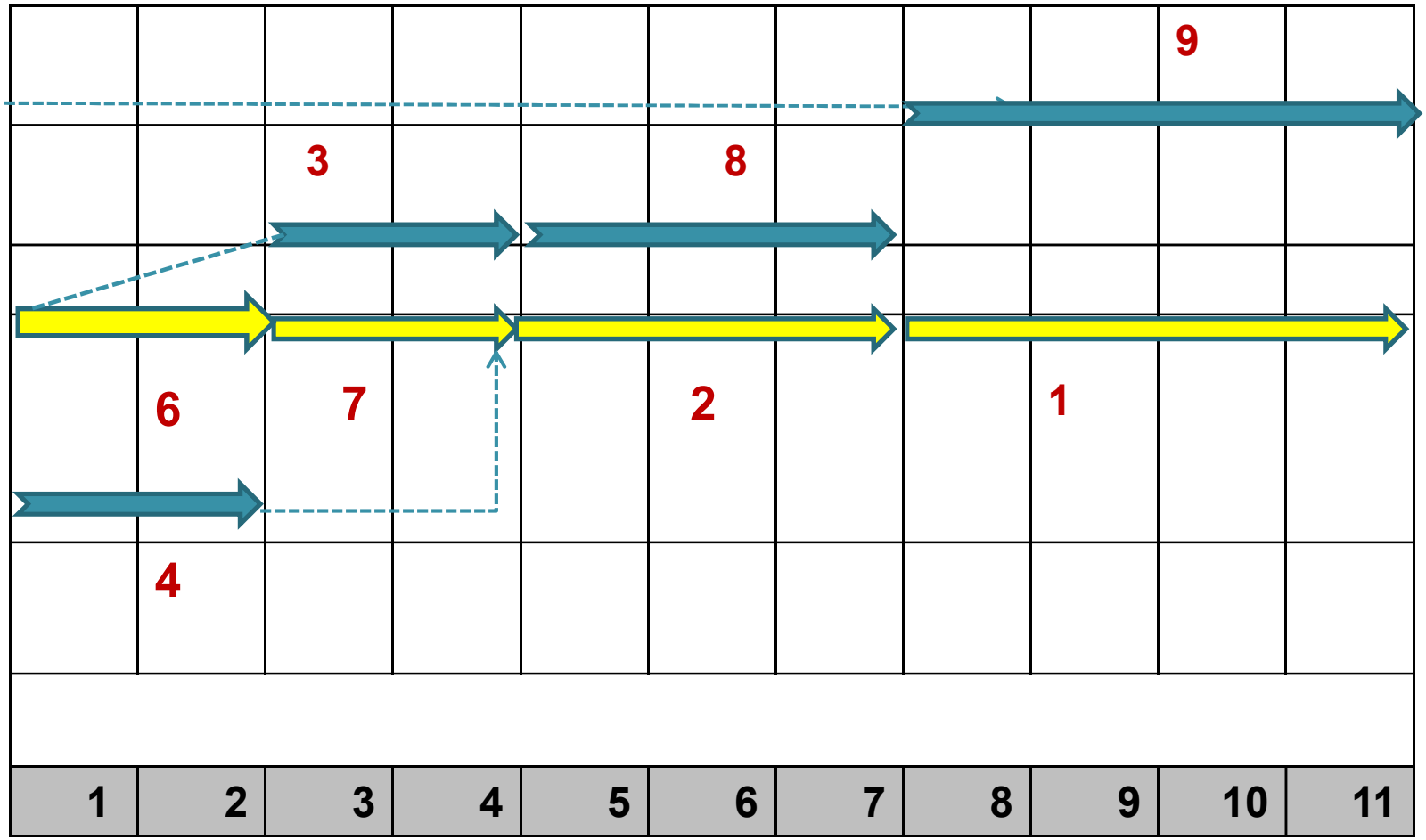
ES SCHEDULE GRAPH



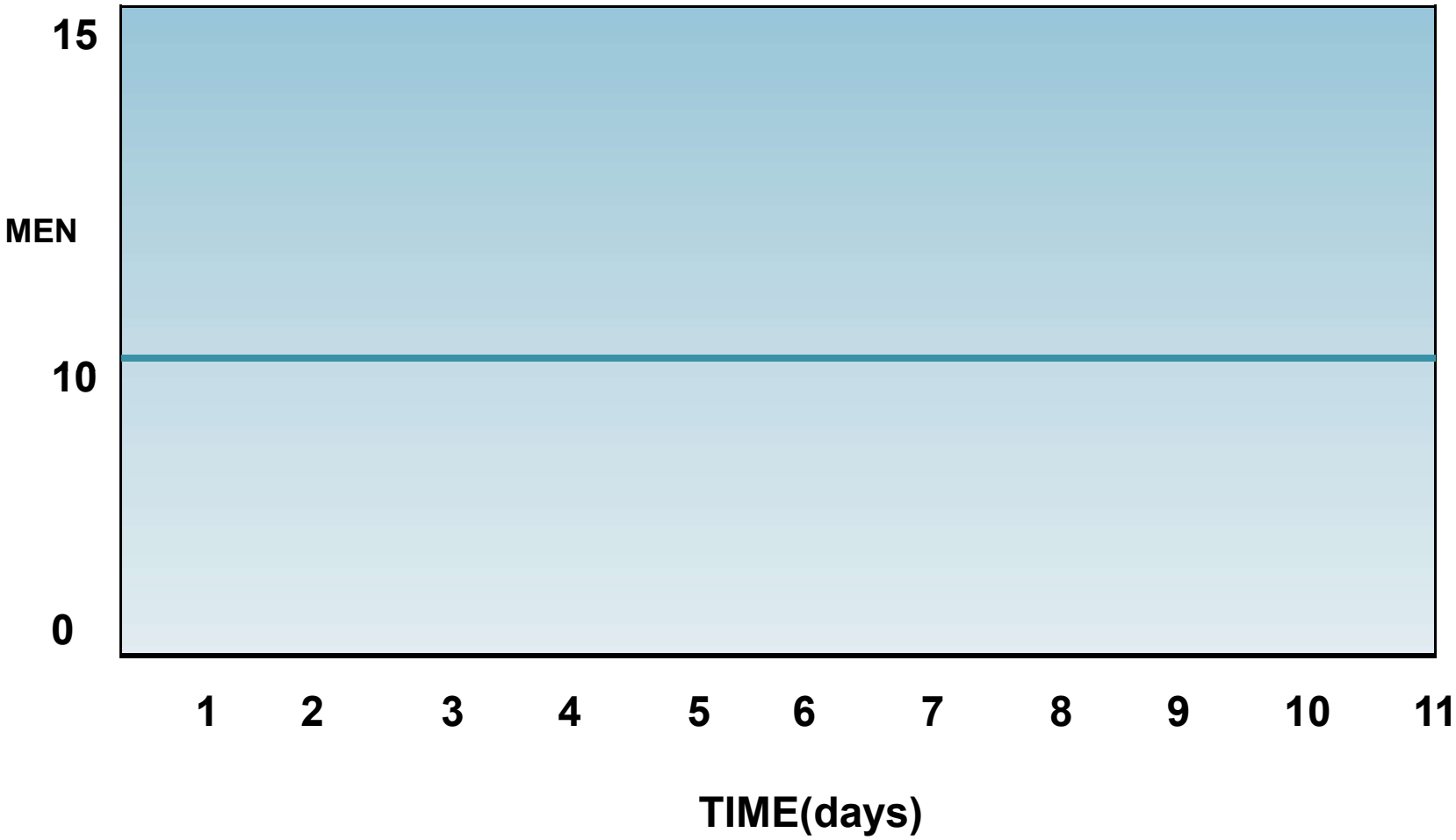
MANPOWER LOADING CHART



RE-SCHEDULE GRAPH

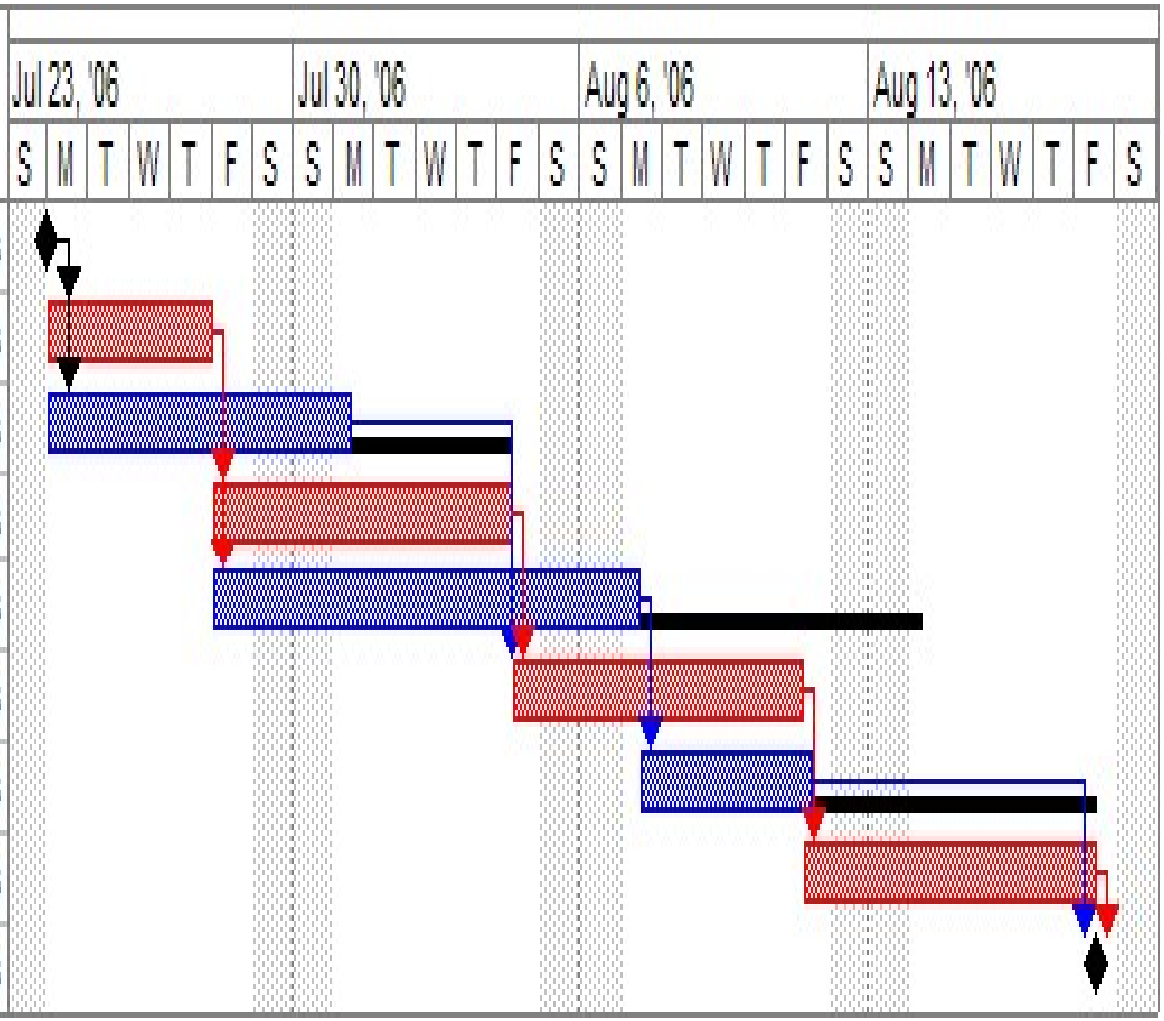


OPTIMUM MANPOWER LOADING CHART



MS PROJECT OUTPUT

ID	Task Name	Predecessors	Duration
1	Start		0 days
2	a	1	4 days
3	b	1	5.33 days
4	c	2	5.17 days
5	d	2	6.33 days
6	e	3,4	5.17 days
7	f	5	4.5 days
8	g	6	5.17 days
9	Finish	7,8	0 days



A project is complete when it starts working for you, rather than you working for it.

- Thank you