

# PREFACE

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## PROJECT MANAGEMENT USING PERT/CPM

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This book is the result of my teaching experience in the subject and working experience in various softwares related to Project Management to Sikkim Manipal University, Udupi students for about 8 years. It is designed to meet the requirements of students at Bachelor's, Masters and Ph D levels in Engineering and Management (M E, MCA MBA and Ph D in Project Management, Engg, Computer Applications and Business Administration).

The main highlight of the book is solved problem approach for numerical question problems framed by the author. This book has a large number of problems solved in all 5 chapters.

I am extremely grateful to all my lecturers so far. Special thanks to Prof Srinivasan from IIT Madras who has hosted free videos in NPTEL which I referred to in learning the basics initially while working PERT/CPM numerical problems manually.

I also thank various International software makers in the field of Project Management which made me enable to work on big NUMERICAL PROBLEMS involving lots of complex data.

I also thank software makers who made them easy to solve. There are many problems framed by myself and can be best suitable for Bachelors, Masters & Ph D students during their RESEARCH WORK in the three fields mentioned below:

ENGINEERING-ALL FIELDS. (BACHELOR LEVEL, MASTERS LEVEL AND DOCTORS LEVEL)

COMPUTER APPLICATIONS. (BACHELOR LEVEL, MASTERS LEVEL AND DOCTORS LEVEL)

BUSINESS ADMINISTRATION. (BACHELOR LEVEL, MASTERS LEVEL AND DOCTORS LEVEL)

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## ABOUT THE AUTHOR

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Author's name is Srinivas R Rao, born and done his school level education in Mangalore, Karnataka in a reputed private school Canara High School and PUC(+2) from Canara PUC in Science stream with PCMB as main subjects.

Later, pursuing LL.B(5 Years) course passed the degree in 1999 and done Diploma in Export Management ,Diploma in Customs and Central Excise , Diploma in Business Administration and some important IT subjects like MS-Office,Internet/Email,Visual Basic 6.0,C,C++,Java,Advanced Java,Oracle with D2K,HTML with Javascript,VBscript and Active Server Pages.

Joined as a FACULTY for students in a small computer Institute in 2002 July and later after 4 months worked in a company by name CRP Technologies(I) .P.Ltd as Branch Manager(Risk Manager) for Mangalore,Udupi and Kasargod areas from January 26 2003 to June 11 2007.In the year 2005 pursued MBA distance education course. Currently working as a FACULTY in Sikkim Manipal University , Udupi centre for BBA & MBA students and teaching numerical subjects like Statistics/Operations Research(Mgt Science/Quant. Techniques for Mgt)/Accounting and several numerical and difficult oriented subjects for distance education students in their weekend contact classes from July 2010 till present day.

Thanks

Regards

Author

(SRINIVAS R RAO)

## ABOUT THE BOOK

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### PROJECT MANAGEMENT USING PERT / CPM

### PROGRAMME EVALUATION AND REVIEW TECHNIQUE & CRITICAL PATH METHOD.-WITH GANTT CHARTS.

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This book is on Project Management which is a compulsory subject for B.E, M.E., B Tech, M.Tech.,MBA and Ph.D .However , any Bachelor level students willing to understand Project Management can read it as it contains a lot of numerical problems framed by me.

The book consists of 5 chapters : Single Time Estimate(CPM),Triple Time Estimate(PERT),Crashing, Cost Budgeting, Mean & Standard Deviation given find the critical path.

I opine that this is a unique book as there are a lot of numerical problems solved with the numerical problems framed by me.

A lot of Madras University old question papers questions for B.E , M.B.A & MCA are solved in this book.

HAPPY READING.

THANKS

REGARDS

AUTHOR

SRINIVAS R RAO

# PROJECT MANAGEMENT

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## CHAPTERS:

1. SINGLE TIME ESTIMATE- Calculate project completion time, find critical path, draw network diagram
2. TRIPLE TIME ESTIMATE- Calculate project completion time, find standard deviation and variance, find critical path, draw network diagram
3. CRASHING- Normal time, crash time, normal cost & crash cost involved find PROJECT COMPLETION TIME.
4. COST BUDGETING- Find cost budget for several periods.
5. MEAN STANDARD DEVIATION GIVEN.- Find critical path when standard deviation and mean are given.

## LIST OF FORMULAE :

1. EST refers to Earliest start time of an activity.  
= Maximum (EFT value of all immediate predecessors)
2. EFT refers to Earliest finish time of an activity.  
= EST + Activity Time
3. LFT refers to Latest finish time of an activity.  
= Minimum (LST value of all immediate followers)
4. LST refers to Latest start time of an activity  
= LFT – Activity Time.
5. Slack refers to Slack time in an activity.  
= LST – EST or Slack = LFT – EFT
6.  $T$  refers to Expected completion time of an activity.  
=  $(a + 4m + b)/6$
7. Variance =  $[(b - a)/6]^2$  refers to variance of an activity

**8.** Standard deviation =  $\sqrt{\text{Variance}} = (b - a) / 6$

**9.** Project variance Refers to Variance of the project completion time.

=  $\Sigma$  (Variances of activities on critical path)

**10.** *Z* refers to Number of standard deviations the target completion time lies from the expected completion time, using the normal distribution.

= (target completion time – expected completion time) /  $\sigma_p$

**11.** Target completion time refers to Target completion time for given probability of completion.

= Expected completion time +  $Z \times \sigma_p$

**12.** Value of work completed refers to Value of work completed in an activity at a specific point in time.

= Percent of work completed  $\times$  Total activity budget

**13.** Activity cost difference refers to Cost difference in an activity at a specific point in time.

= Actual cost – Value of work completed

**14.** Crash cost per period =  $\frac{(\text{Crash cost} - \text{Normal cost})}{(\text{Normal time} - \text{Crash time})}$

Crash cost per period refers to cost of reducing an activity completion time per time period.

Module/submodel: Project Management (PERT/CPM)/Single time estimate

Problem title: (untitled)

Method: Single time estimate

Network type: Immediate predecessor list

### Results -----

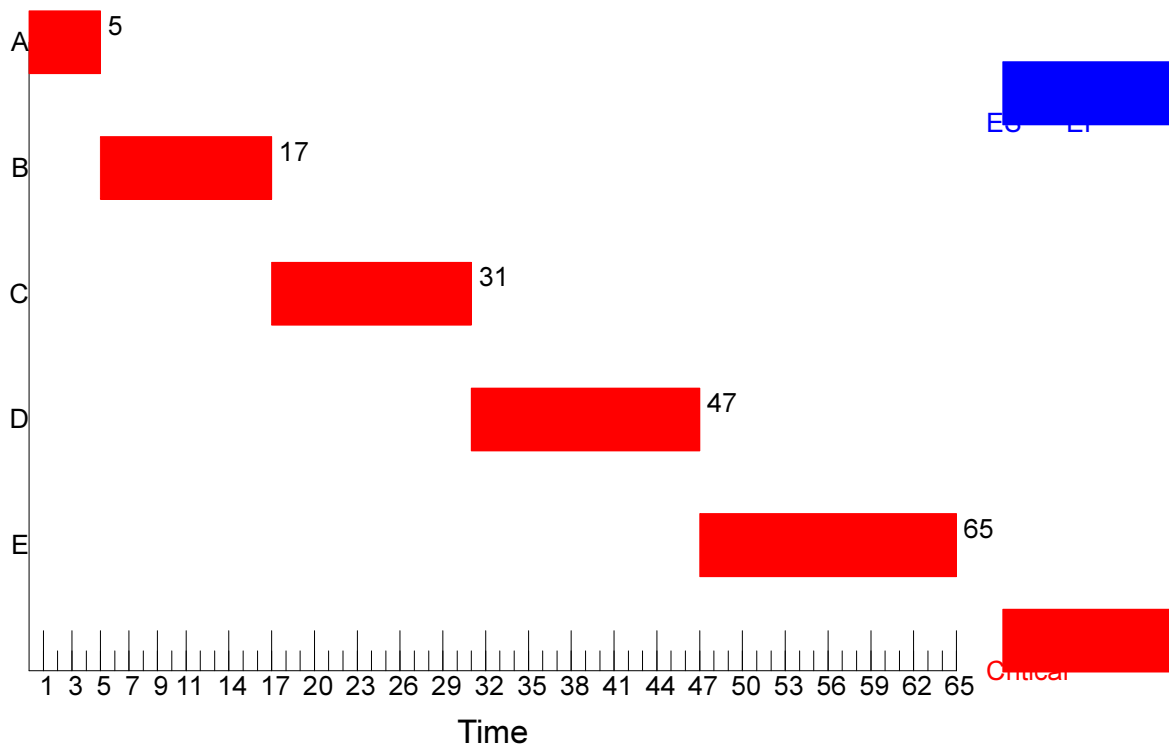
Activity                      Precedences

A  
B                                  A  
C                                  B, A  
D                                  C, B  
E                                  D, B, A

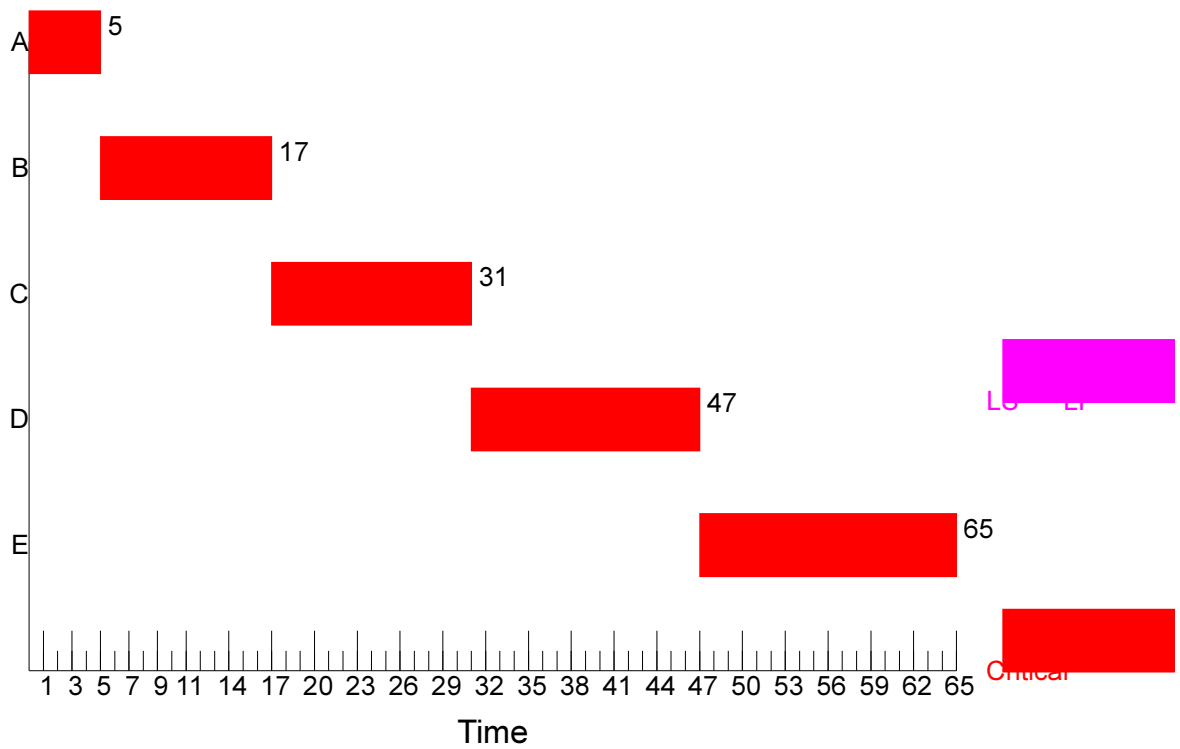
Project completion time = 65

Activity	time	Early Start	Early Finish	Late Start	Late Finish	Slack
A	5	0	5	0	5	0
B	12	5	17	5	17	0
C	14	17	31	17	31	0
D	16	31	47	31	47	0
E	18	47	65	47	65	0

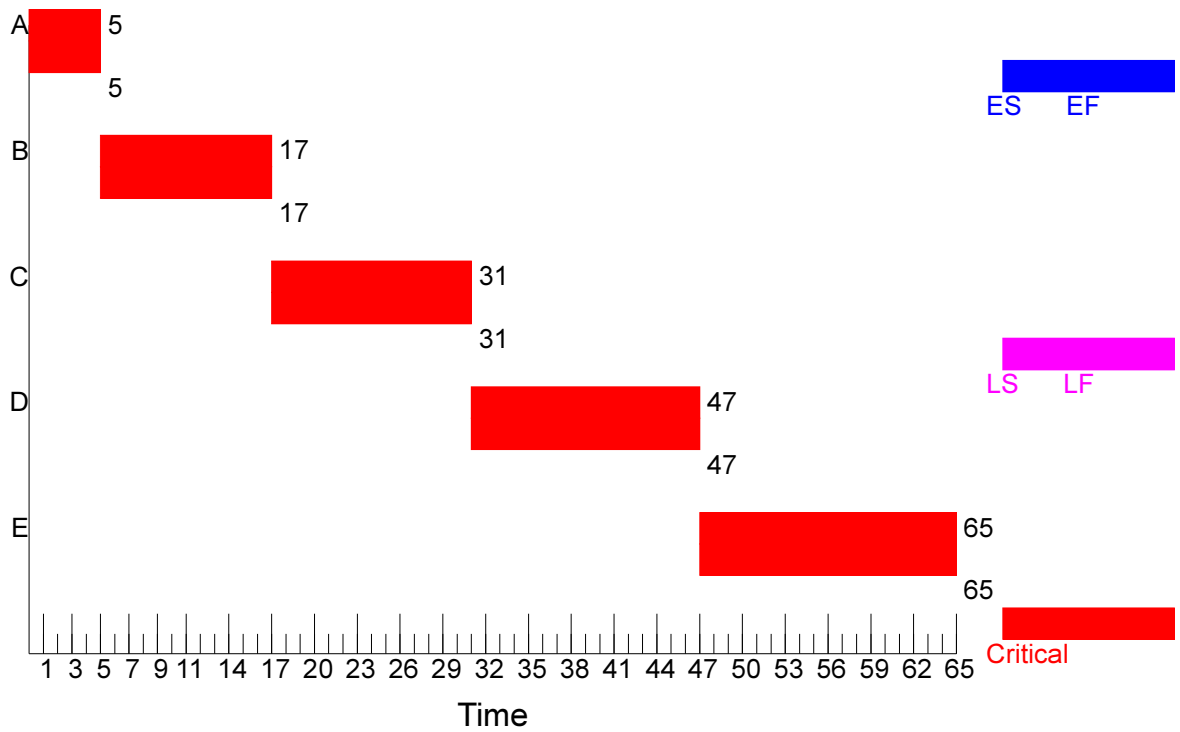
(untitled)  
Gantt chart (Early times)



(untitled)  
Gantt chart (Late times)

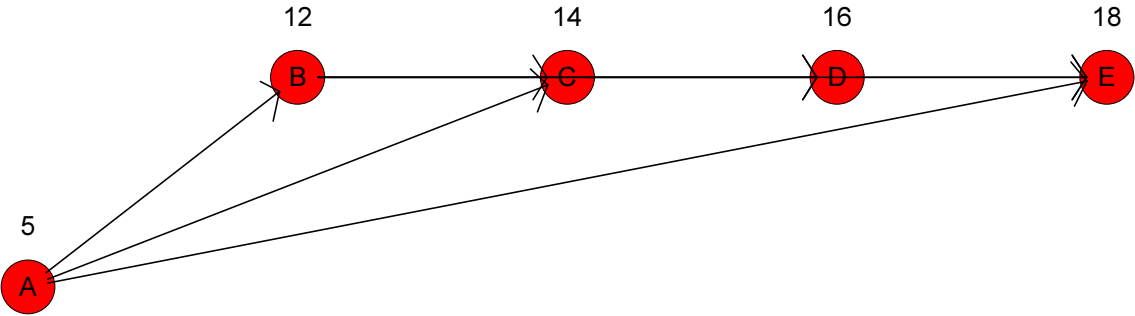


(untitled)  
Gantt chart (Early and Late times)





(untitled)  
Precedence Graph



Module/submodel: Project Management (PERT/CPM)/Single time estimate

Problem title: (untitled)

Method: Single time estimate

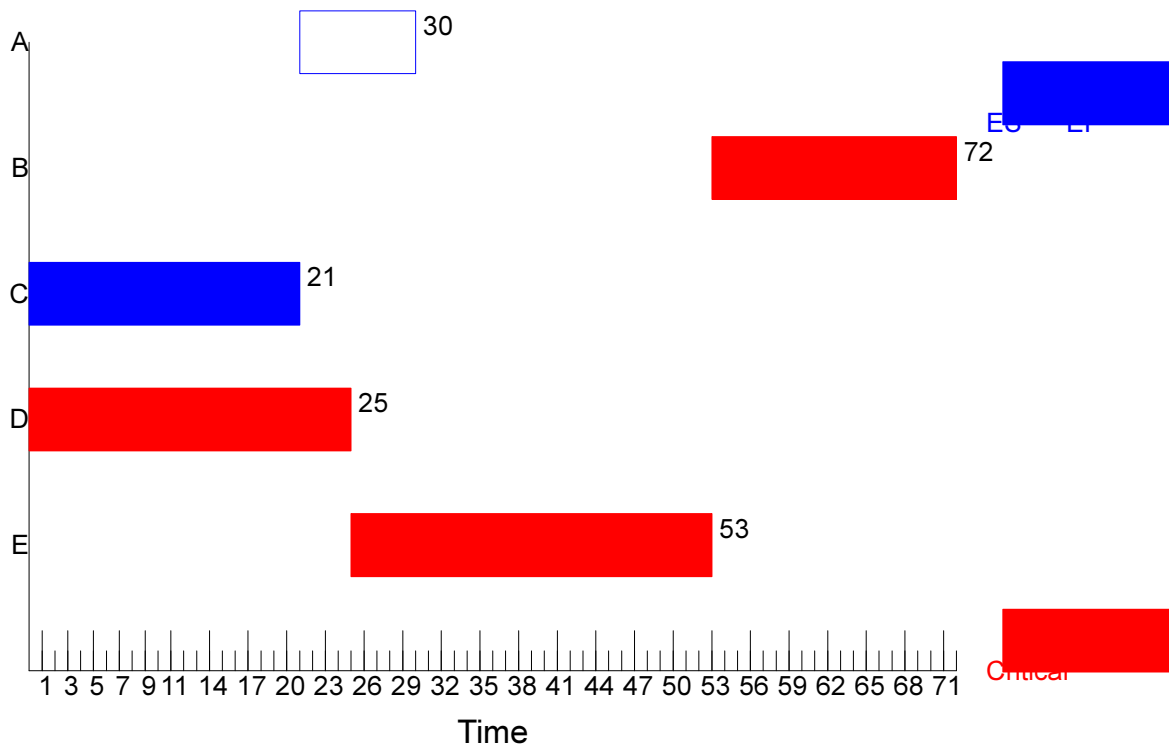
Network type: Start/end node numbers

## Results -----

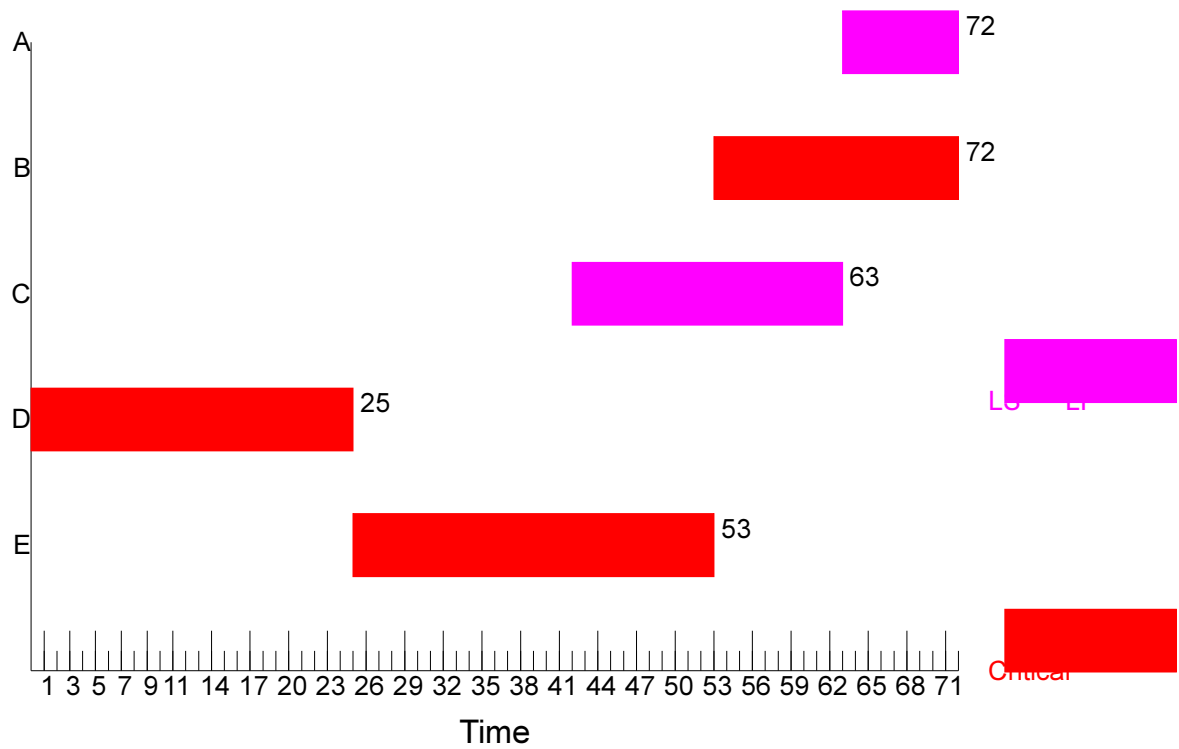
Project completion time = 72

	Start node	End node	Activity time	Early Start	Early Finish	Late Start	Late Finish	Slack
A	2	0	9	21	30	63	72	42
B	1	0	19	53	72	53	72	0
C	3	2	21	0	21	42	63	42
D	5	4	25	0	25	0	25	0
E	4	1	28	25	53	25	53	0

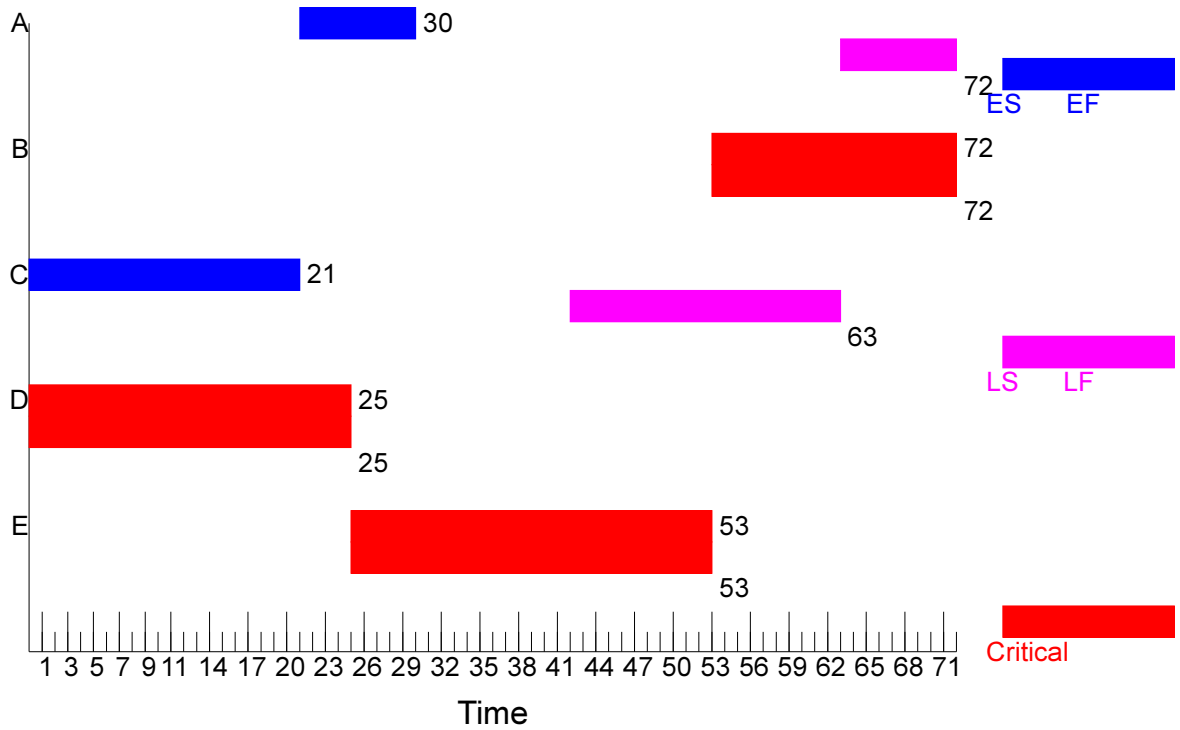
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Gantt chart (Early times)



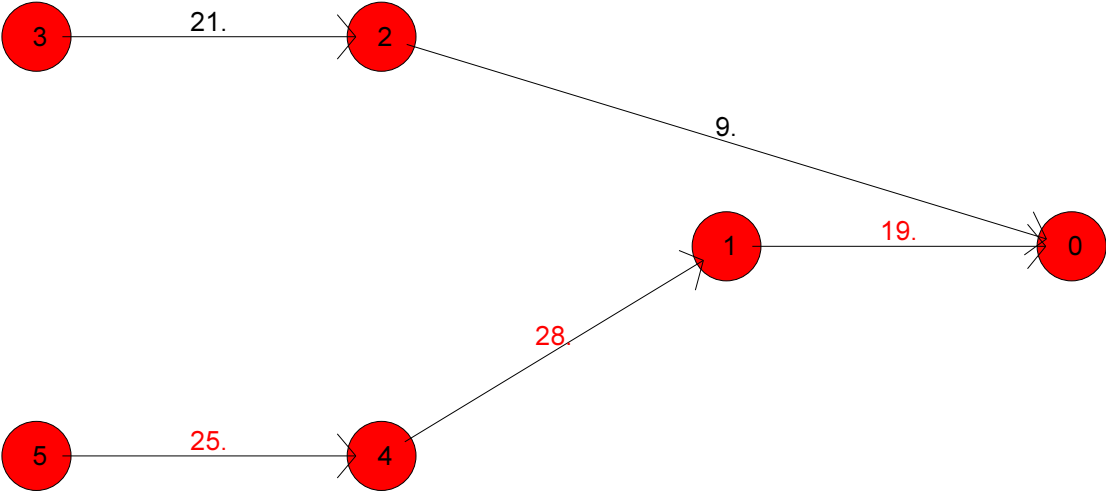
(untitled)  
Gantt chart (Late times)



(untitled)  
Gantt chart (Early and Late times)



(untitled)  
Precedence Graph



Module/submodel: Project Management (PERT/CPM)/Single time estimate

Problem title: (untitled)

Method: Single time estimate

Network type: Immediate predecessor list

### Results -----

Activity                      Precedences

A

B

C

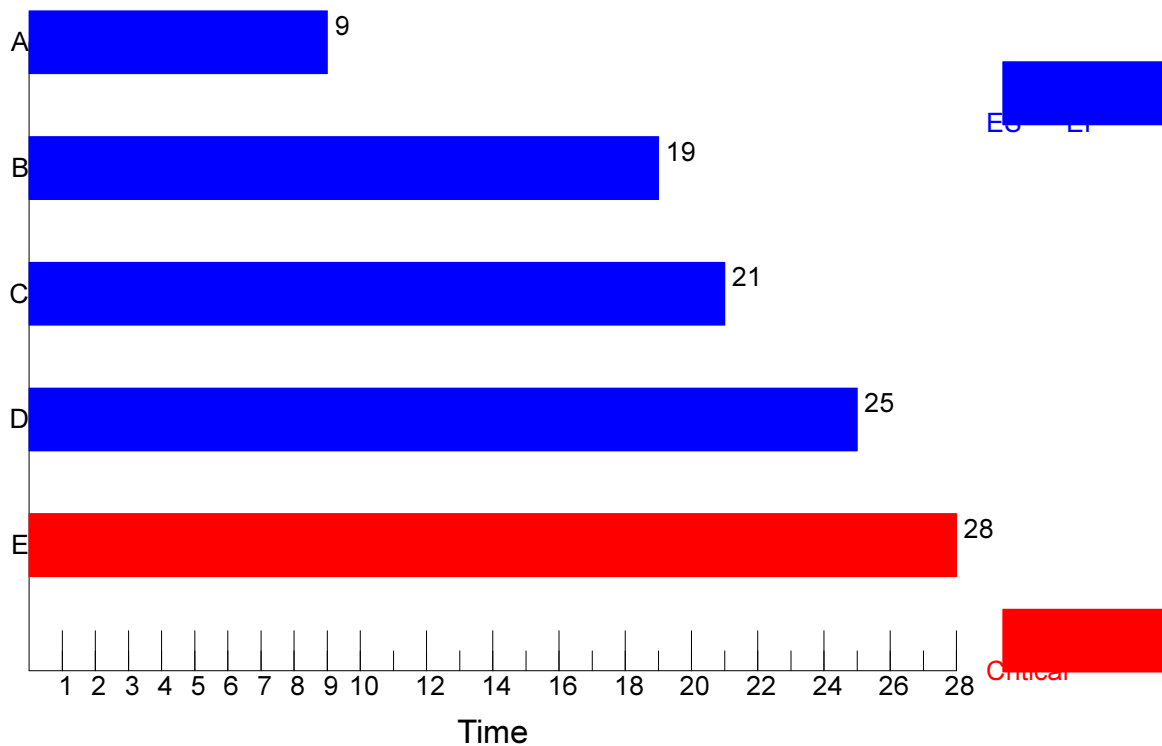
D

E

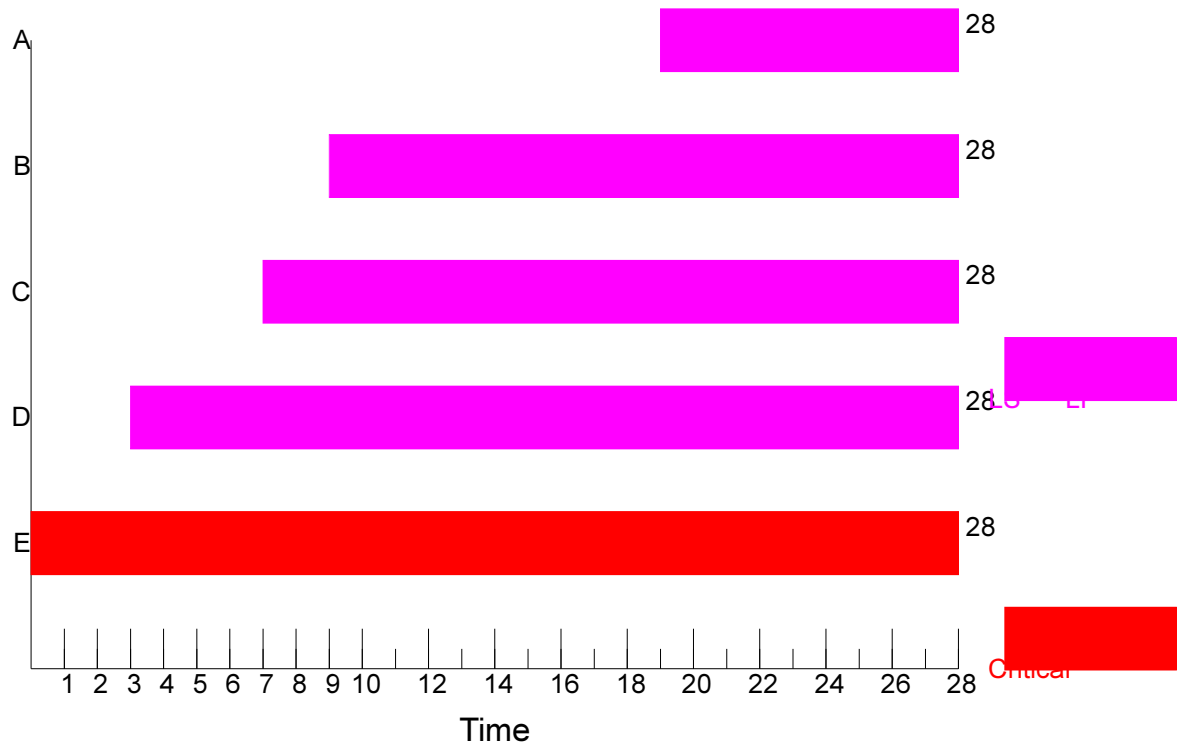
Project completion time = 28

	Activity time	Early Start	Early Finish	Late Start	Late Finish	Slack
A	9	0	9	19	28	19
B	19	0	19	9	28	9
C	21	0	21	7	28	7
D	25	0	25	3	28	3
E	28	0	28	0	28	0

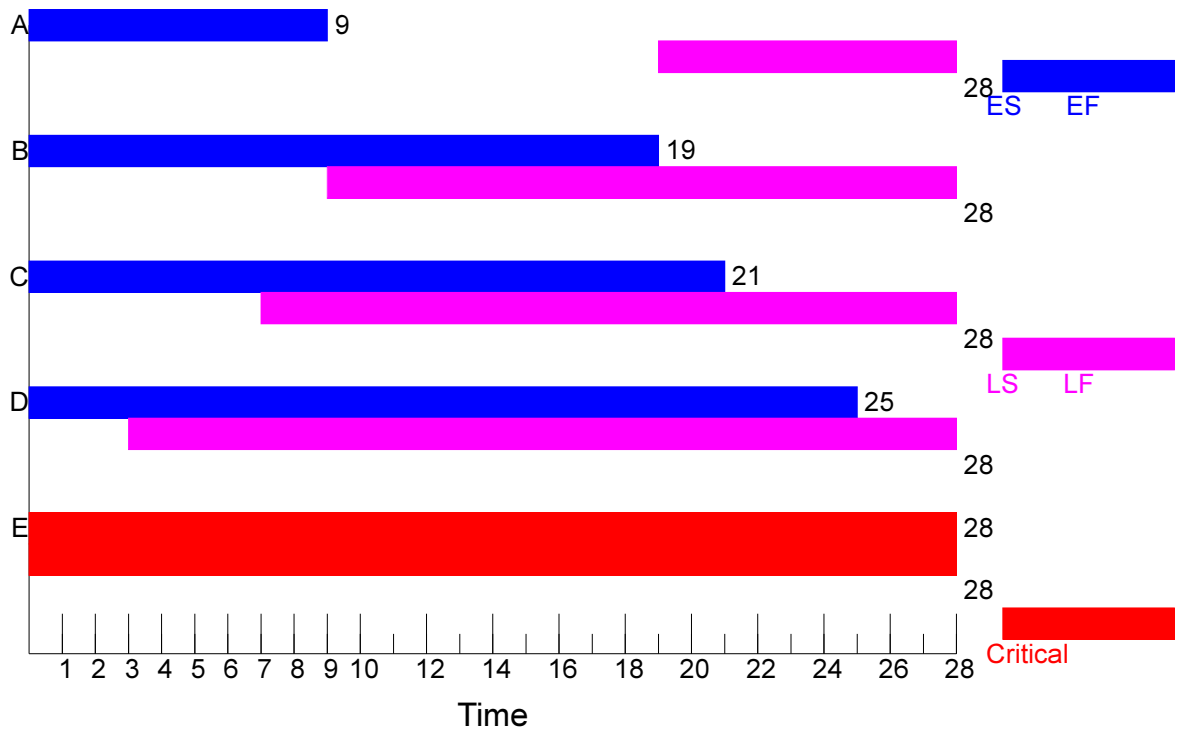
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Gantt chart (Early times)



(untitled)  
Gantt chart (Late times)

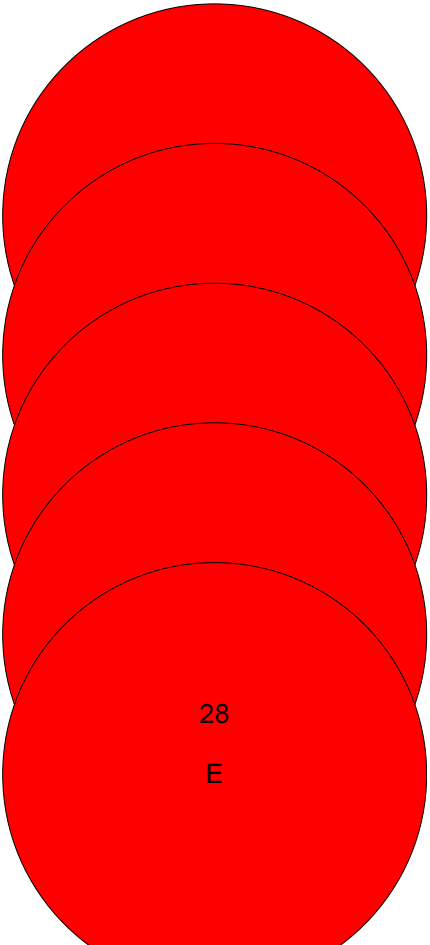


(untitled)  
Gantt chart (Early and Late times)





(untitled)  
Precedence Graph



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