OPTIMIZATION OF PROJECT COST BY MS PROGRAME

Vikash Raikwar[1]; Sanjay Tiwari[2]
[1,2]*Department of Civil Engineering*
MITS Gwalior-474005
vikii009@gmail.com , sanjaymits2@gmail.com

Abstract:

Existing literature in this field the resources as rule are limited. The schedule is therefore needed to satisfy the resource constraints and also minimize project cost. In This research study some concept of linear programing and critical path method for determining the cost of the project crashing a unit day cost operations by ms program.

KEYWORD: - CPM/PERT, TCT PROBLEMS, PROGRAMING METHOLOGY

INTRODUCTION:-

In a project management is characterized as an extensive, well defined goal of project. The job of each activity normally requires one or more resources. a resource is defined by the physical variable such as manpower, materials. the various resources, which are to be developed for execution of a large project may fall into a hundred or more. A rule of the resources are limited in availability, the unlimited availability of resources is not an economical proposition as the cost of idle resource will be alarming in most of the cases. The network techniques as CPM/PERT project scheduling and the methods of CPM/PERT/TIME and PERT/COST are well developed making use of the project graph particularly arrow diagram. In the project the slake value is measured as the difference between the activities early start and late start time. In the help of the "critical path" or the longest ordered sequences of activities through the project graph.

TIME COST TRADE OFF:-

The time cost trade off problem consists of reducing project completion time by adding additional resources to certain activities so that the execution of these activities so that the execution of these activities may be accelerated. The time cost trade off problem may also be interest in the limited resource case.in such case a time cost trade off problem are sometime described as resource allocation problems because of implicit relationship between cost and resources. It is proved that there exists a unique zero slake schedule which minimizes project cost. The algorithm is extended to realistic bounded cost curves. These method start with the lowest cost schedule and by making a series of resources along the critical path, the project duration as reduced to some desired value. The selecting of successive activities to be augmented is according to the smallness of their cost curve slope.

Terminology:

NT=Normal time (duration) of activity, NC= Crash time (duration) of activity, CT= Cost of Activity at NT CN= Cost of activity at NC

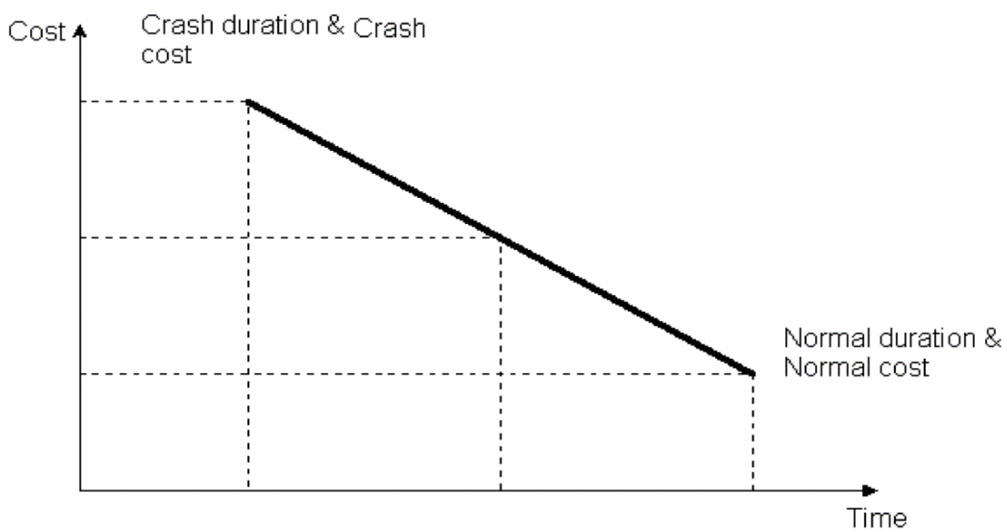
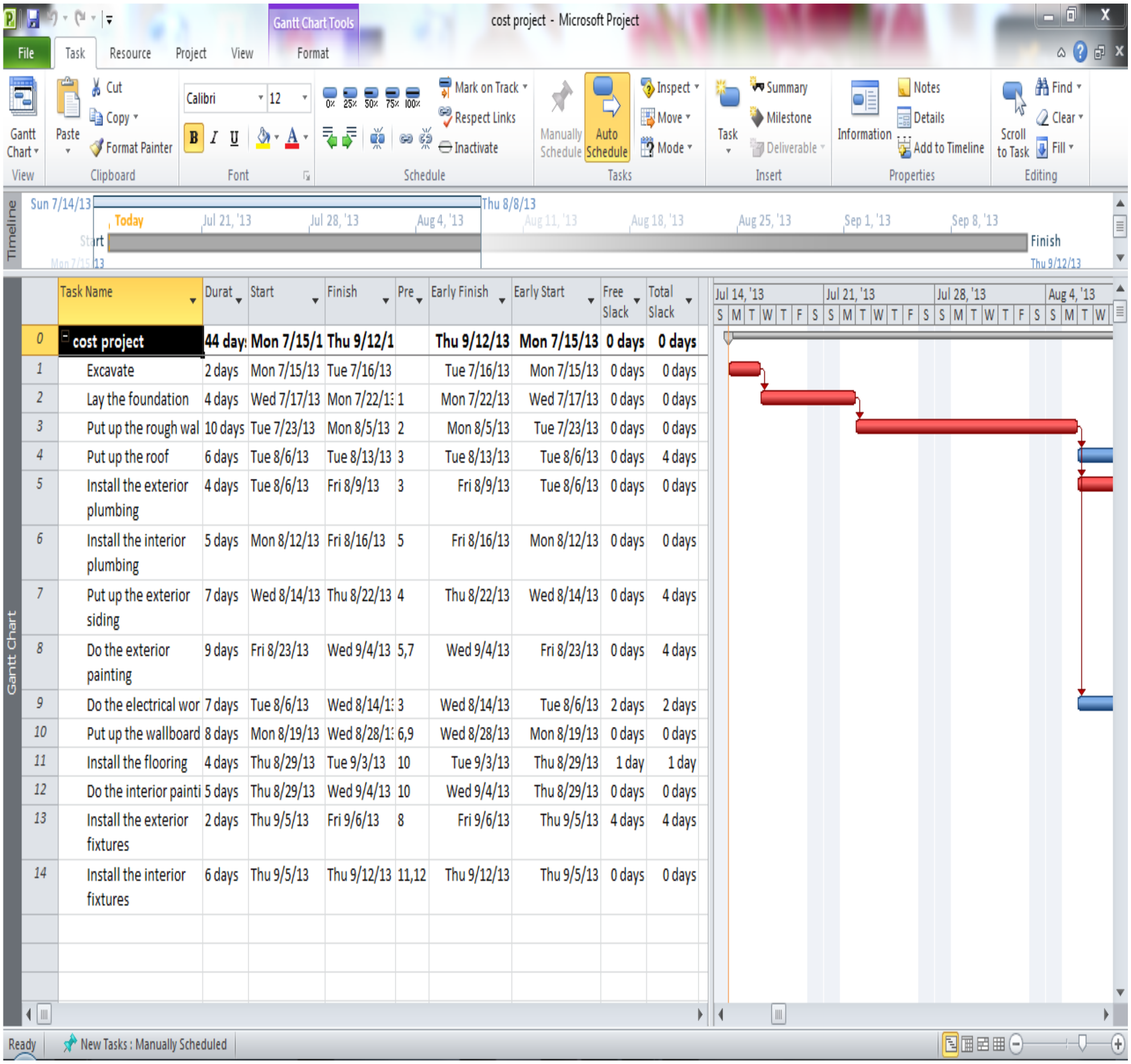


Fig no.1

A PROTOTYPE EXAMPLE—

Activity	**Activity Description**	**Immediate Predecessors**	**Estimated Duration**
A	EXCAVATE	-	2
B	Lay the foundation	A	4
C	Put up the rough wall	B	10
D	Put up the roof	C	6
E	Install the exterior plumbing	C	4
F	Install the interior plumbing	E	5
G	Put up the exterior siding	D	7
H	Do the exterior painting	E,G	9
I	Do the electrical work	C	7
J	Put up the wallboard	F,I	8
K	Install the flooring	J	4
L	Do the interior painting	J	5
M	Install the exterior fixtures	H	2
N	Install the interior fixtures	K,L	6

PROJECT DURATION WITH THE HELP OF THE MS PROJECT:-



	Task Name	Durat	Start	Finish	Pre	Early Finish	Early Start	Free Slack	Total Slack
0	cost project	44 day:	Mon 7/15/1	Thu 9/12/1		Thu 9/12/13	Mon 7/15/13	0 days	0 days
1	Excavate	2 days	Mon 7/15/13	Tue 7/16/13		Tue 7/16/13	Mon 7/15/13	0 days	0 days
2	Lay the foundation	4 days	Wed 7/17/13	Mon 7/22/1:	1	Mon 7/22/13	Wed 7/17/13	0 days	0 days
3	Put up the rough wal	10 days	Tue 7/23/13	Mon 8/5/13	2	Mon 8/5/13	Tue 7/23/13	0 days	0 days
4	Put up the roof	6 days	Tue 8/6/13	Tue 8/13/13	3	Tue 8/13/13	Tue 8/6/13	0 days	4 days
5	Install the exterior plumbing	4 days	Tue 8/6/13	Fri 8/9/13	3	Fri 8/9/13	Tue 8/6/13	0 days	0 days
6	Install the interior plumbing	5 days	Mon 8/12/13	Fri 8/16/13	5	Fri 8/16/13	Mon 8/12/13	0 days	0 days
7	Put up the exterior siding	7 days	Wed 8/14/13	Thu 8/22/13	4	Thu 8/22/13	Wed 8/14/13	0 days	4 days
8	Do the exterior painting	9 days	Fri 8/23/13	Wed 9/4/13	5,7	Wed 9/4/13	Fri 8/23/13	0 days	4 days
9	Do the electrical wor	7 days	Tue 8/6/13	Wed 8/14/1:	3	Wed 8/14/13	Tue 8/6/13	2 days	2 days
10	Put up the wallboard	8 days	Mon 8/19/13	Wed 8/28/1:	6,9	Wed 8/28/13	Mon 8/19/13	0 days	0 days
11	Install the flooring	4 days	Thu 8/29/13	Tue 9/3/13	10	Tue 9/3/13	Thu 8/29/13	1 day	1 day
12	Do the interior painti	5 days	Thu 8/29/13	Wed 9/4/13	10	Wed 9/4/13	Thu 8/29/13	0 days	0 days
13	Install the exterior fixtures	2 days	Thu 9/5/13	Fri 9/6/13	8	Fri 9/6/13	Thu 9/5/13	4 days	4 days
14	Install the interior fixtures	6 days	Thu 9/5/13	Thu 9/12/13	11,12	Thu 9/12/13	Thu 9/5/13	0 days	0 days

Fig no 2

In a Microsoft Project, all the activities have the constraint type set as:-

As late as possible:-For project scheduled from the finish date, schedules the latest possible start and finish date for the task.

As soon as possible:-For project scheduled from the start date, schedules the earliest possible start and finish dates for the task.

Finish no earlier than:-For project scheduled from the start date, Indicates the earliest possible date that the task can be completed, and the task cannot finish any time before the specified date.

Finish no later than:-For project scheduled from the finish date, Indicates the latest possible date that the task can be completed, and the task can be finished on or before the specified date.

Start no earlier than: - For project scheduled from the start date, Indicates the earliest possible date that the task can being, and the task cannot start any time before the specified date.

Start no later than:**-** For project scheduled from the finish date, Indicates the latest possible date that the task can begin, and the task can start on or before the specified date.

Must finish on:- Indicates the exact date on which the task must finish, Other scheduling parameters such as task dependencies, lead or lag time, and resource leveling become secondary to this.

Must start on:**-** Indicates the exact date on which the task must being. Other scheduling parameters such as task dependencies lead or lag time, and resources leveling become secondary to this.

Time-cost trade-off data for the activities of Reliable project:

Activity	**Time**		**Cost**		**Maximum Reduction in Time**	**Crash Cost per Week Saved**
	Normal	**Crash**	**Normal**	**Crash**		
A	2	1	$180,000	$280,000	1	$100,000
B	4	2	$320,000	$420,000	2	$ 50,000
C	10	7	$620,000	$860,000	3	$ 80,000
D	6	4	$260,000	$340,000	2	$ 40,000
E	4	3	$410,000	$570,000	1	$160,000
F	5	3	$180,000	$260,000	2	$ 40,000
G	7	4	$900,000	$1,020,000	3	$ 40,000
H	9	6	$200,000	$380,000	3	$ 60,000
I	7	5	$210,000	$270,000	2	$ 30,000
J	8	6	$430,000	$490,000	2	$ 30,000
K	4	3	$160,000	$200,000	1	$ 40,000
L	5	3	$250,000	$350,000	2	$ 50,000
M	2	1	$100,000	$200,000	1	$100,000
N	6	3	$330,000	$510,000	3	$ 60,000

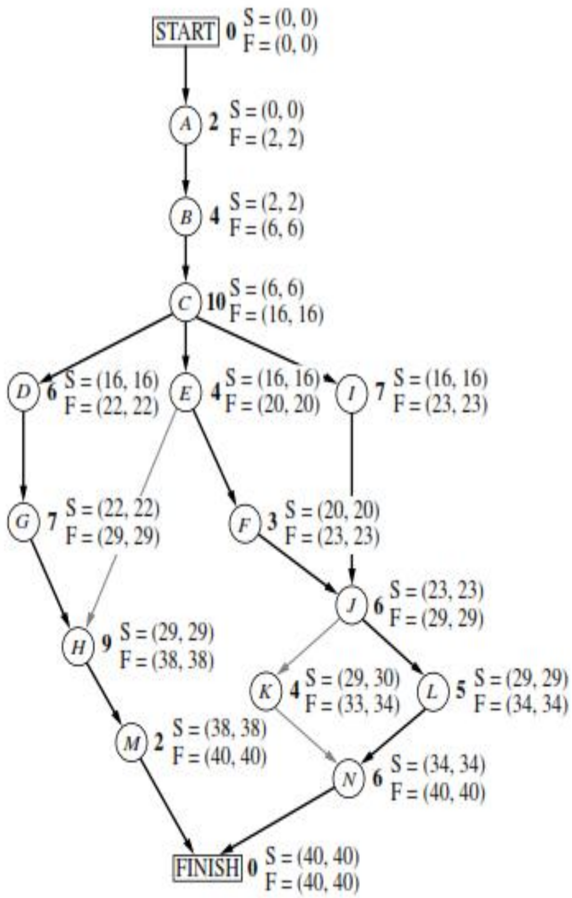


Fig no. 3

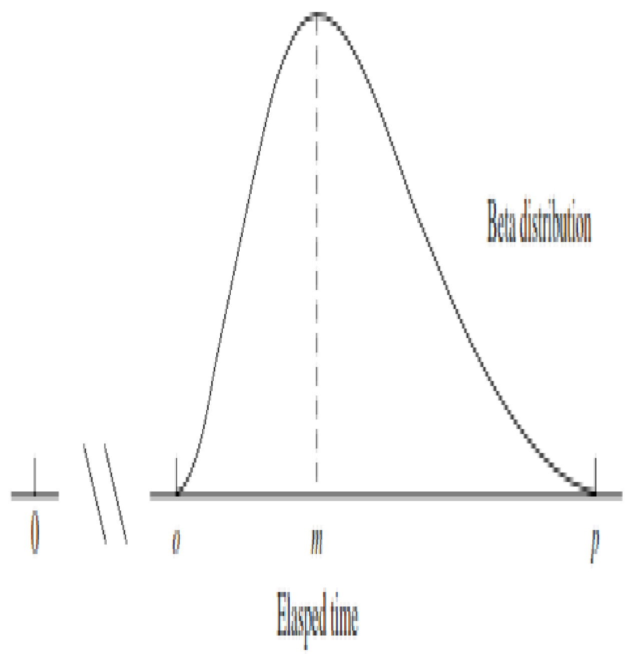


Fig no.4

The PERT Three-Estimate Approach

The three estimates to be obtained for each activity are

Most likely estimate (*m*) _ estimate of the most likely value of the duration,

Optimistic estimate (*o*) _ estimate of the duration under the most favorable conditions,

Pessimistic estimate (*p*) _ estimate of the duration under the most unfavorable conditions.

The intended location of these three estimates with respect to the probability distribution is shown in Fig no.5. Thus, the optimistic and pessimistic estimates are meant to lie at the extremes of what is possible, whereas the most likely estimate provides the highest point of the probability.

Expected value and variance of the duration of each activity for Reliable' project:-

Activity	**Optimistic Estimate O**	**Most Likely Estimate M**	**Pessimistic Estimate P**	**Mean** $\mu = \frac{O+4M+P}{6}$	**Variance** $\alpha^2 = \frac{(P-O)^2}{6}$
A	1	2	3	2	1/9
B	2	3.5	8	4	1
C	6	9	18	10	4
D	4	5.5	10	6	1
E	1	4.5	5	4	4/9
F	4	4	10	5	1
G	5	6.5	11	7	1
H	5	8	17	9	4
I	3	7.5	9	7	1
J	3	9	9	8	1
K	4	4	4	4	0
L	1	5.5	7	5	1
M	1	2	3	2	1/9
N	5	5.5	9	6	4/9

PROGRAMING METHODS:-

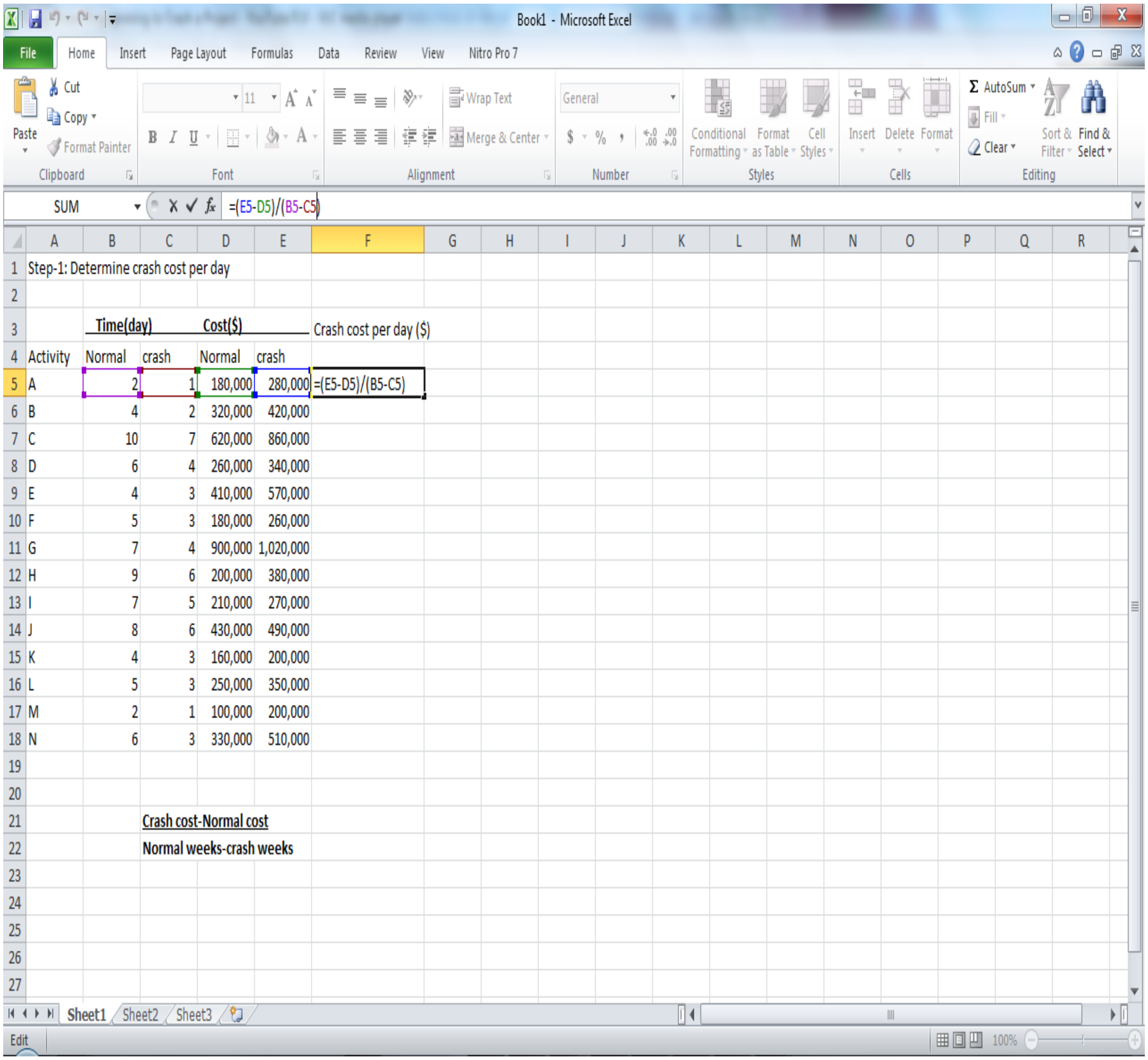
The methods used to fine an analytical solution to limited resource scheduling and costing of a project integer programming. These methods even with simplification like allowing crashing or stretching of activity are formulated in size and in most cases exceed the capacity of present computation. To determine when jobs should be processed depends upon the desired objectives.

1- Minimize total throughout time for all projects.

2- Minimize the time by which all projects are completed.

3- Minimize total lateness or lateness penalty for all projects.

PROJECT COST WITH USING MS EXCEL:-



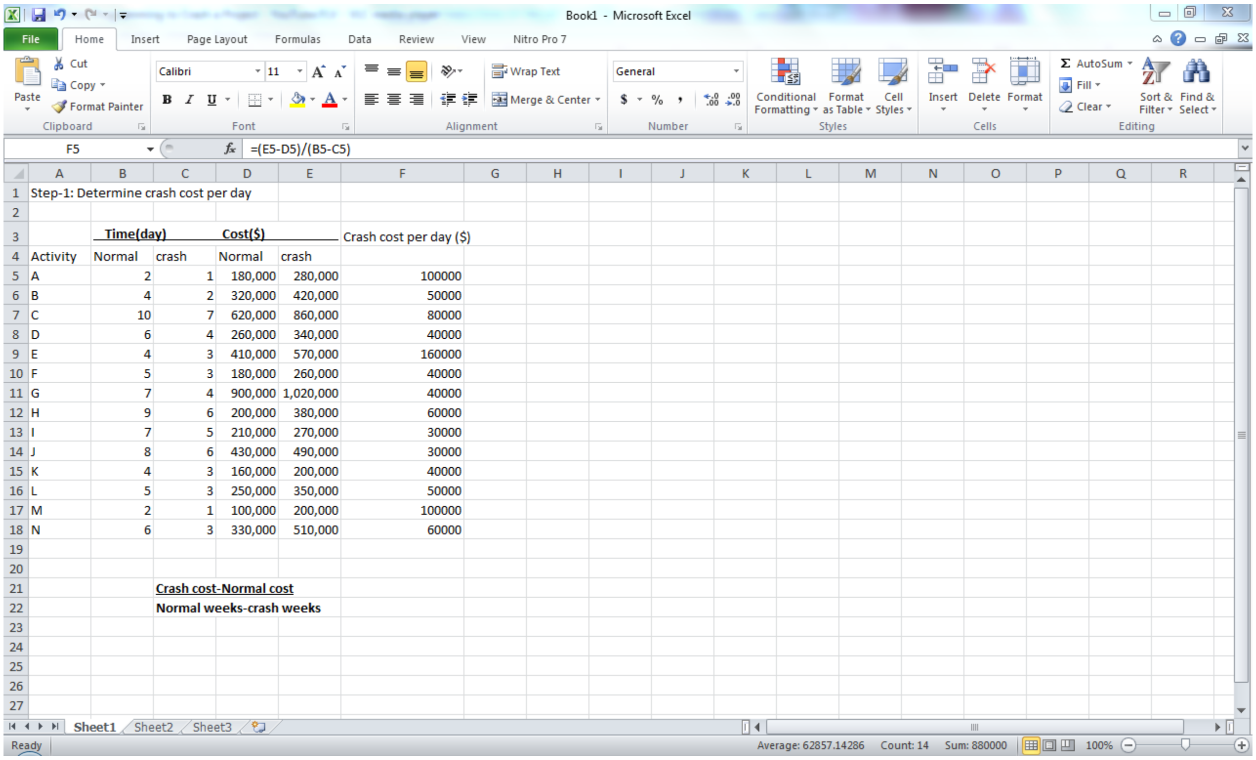
Step-1: Determine crash cost per day

	Time(day)		Cost($)		Crash cost per day ($)
Activity	Normal	crash	Normal	crash	
A	2	1	180,000	280,000	=(E5-D5)/(B5-C5)
B	4	2	320,000	420,000	
C	10	7	620,000	860,000	
D	6	4	260,000	340,000	
E	4	3	410,000	570,000	
F	5	3	180,000	260,000	
G	7	4	900,000	1,020,000	
H	9	6	200,000	380,000	
I	7	5	210,000	270,000	
J	8	6	430,000	490,000	
K	4	3	160,000	200,000	
L	5	3	250,000	350,000	
M	2	1	100,000	200,000	
N	6	3	330,000	510,000	

Crash cost-Normal cost

Normal weeks-crash weeks

Fig no. 5

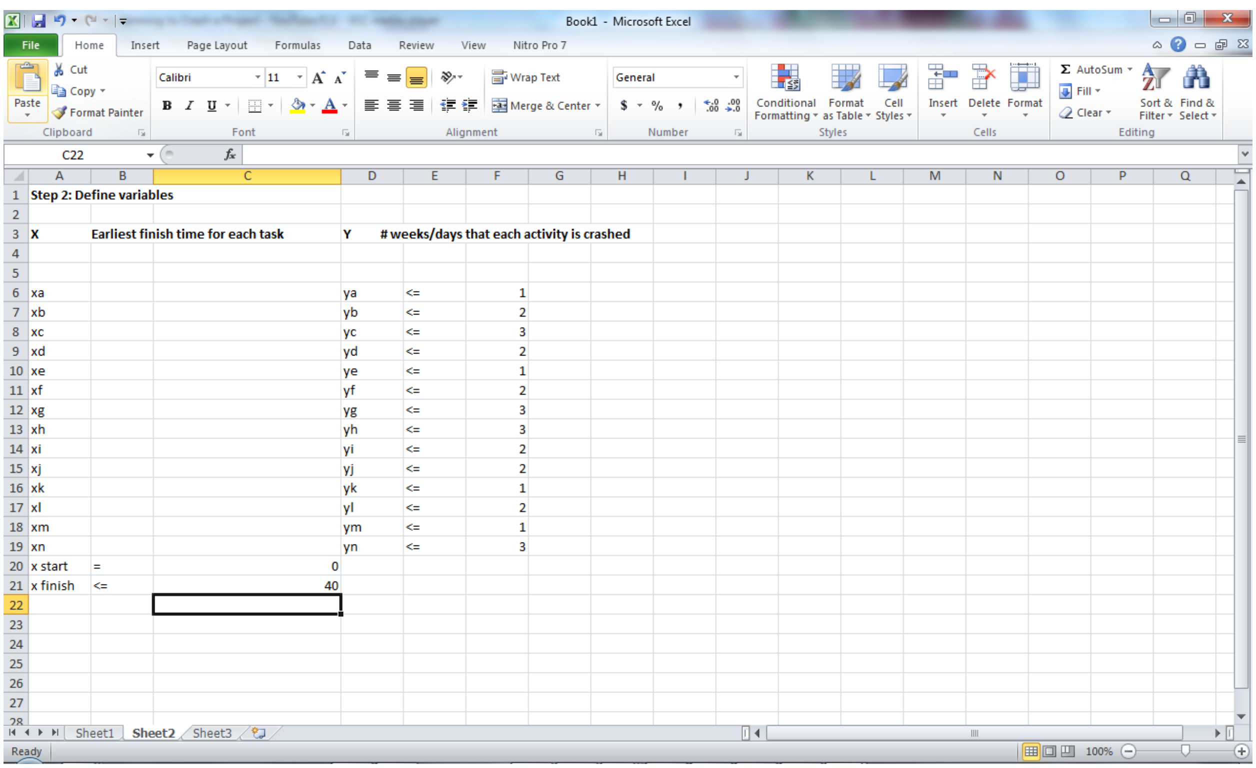


Step-1: Determine crash cost per day

	Time(day)		Cost($)		
Activity	Normal	crash	Normal	crash	Crash cost per day ($)
A	2	1	180,000	280,000	100000
B	4	2	320,000	420,000	50000
C	10	7	620,000	860,000	80000
D	6	4	260,000	340,000	40000
E	4	3	410,000	570,000	160000
F	5	3	180,000	260,000	40000
G	7	4	900,000	1,020,000	40000
H	9	6	200,000	380,000	60000
I	7	5	210,000	270,000	30000
J	8	6	430,000	490,000	30000
K	4	3	160,000	200,000	40000
L	5	3	250,000	350,000	50000
M	2	1	100,000	200,000	100000
N	6	3	330,000	510,000	60000

Crash cost-Normal cost
Normal weeks-crash weeks

Fig no. 6



Step 2: Define variables

X	Earliest finish time for each task		Y	# weeks/days that each activity is crashed	
xa			ya	<=	1
xb			yb	<=	2
xc			yc	<=	3
xd			yd	<=	2
xe			ye	<=	1
xf			yf	<=	2
xg			yg	<=	3
xh			yh	<=	3
xi			yi	<=	2
xj			yj	<=	2
xk			yk	<=	1
xl			yl	<=	2
xm			ym	<=	1
xn			yn	<=	3
x start	=	0			
x finish	<=	40			

Fig no. 7

FORMULATION USED IN CRASHING PROJECT:-

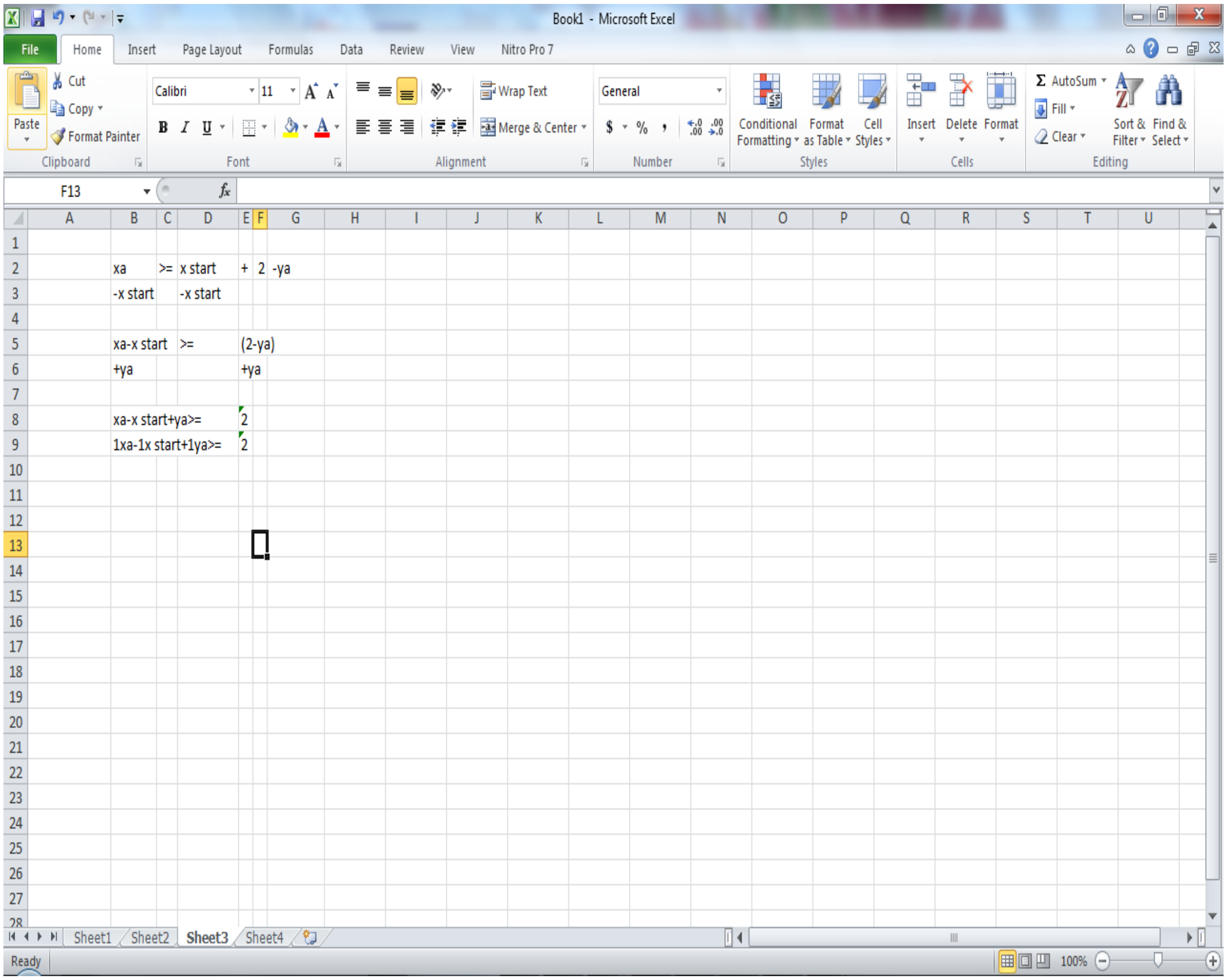
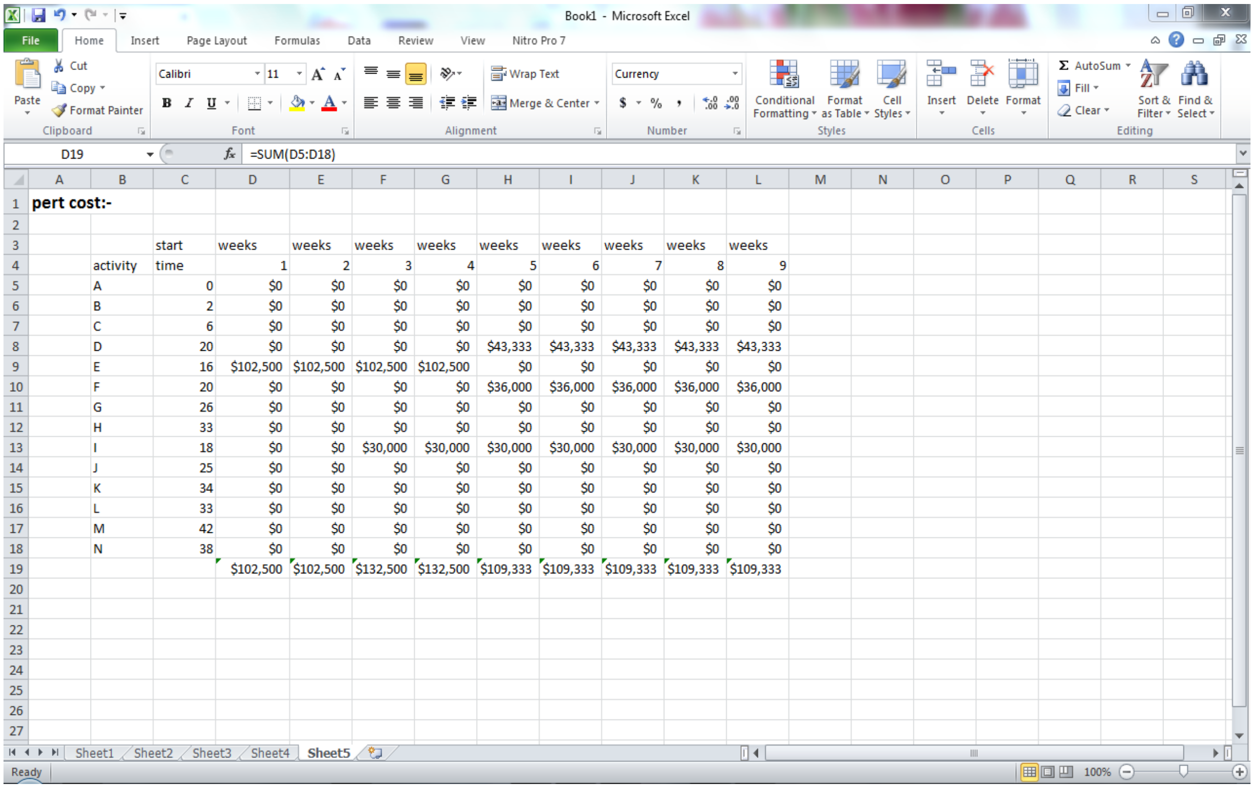


Fig no. 8

Cost result:-



pert cost:-

	start	weeks	weeks	weeks	weeks	weeks	weeks	weeks	weeks	weeks
activity	time	1	2	3	4	5	6	7	8	9
A	0	$0	$0	$0	$0	$0	$0	$0	$0	$0
B	2	$0	$0	$0	$0	$0	$0	$0	$0	$0
C	6	$0	$0	$0	$0	$0	$0	$0	$0	$0
D	20	$0	$0	$0	$0	$43,333	$43,333	$43,333	$43,333	$43,333
E	16	$102,500	$102,500	$102,500	$102,500	$0	$0	$0	$0	$0
F	20	$0	$0	$0	$0	$36,000	$36,000	$36,000	$36,000	$36,000
G	26	$0	$0	$0	$0	$0	$0	$0	$0	$0
H	33	$0	$0	$0	$0	$0	$0	$0	$0	$0
I	18	$0	$0	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
J	25	$0	$0	$0	$0	$0	$0	$0	$0	$0
K	34	$0	$0	$0	$0	$0	$0	$0	$0	$0
L	33	$0	$0	$0	$0	$0	$0	$0	$0	$0
M	42	$0	$0	$0	$0	$0	$0	$0	$0	$0
N	38	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$102,500	$102,500	$132,500	$132,500	$109,333	$109,333	$109,333	$109,333	$109,333

Fig no. 9

Literature review:

'B. Gokhan Celik PhD, LEED-AP' Roger Williams University Bristol, Rhode Island and Providence Plantations 'S. Gokce Celik' Havelsan Hava Electronic Sanayi ve Ticaret A.S. Ankara, Turkey 'Gilbert C**.** Brunnhoeffer, III PhD, P.E'**.** Roger Williams University Bristol, Rhode Island and Providence Plantations The calculation of the minimum duration of a schedule (crashing the schedule), and identifying various milestones (durations) along the way, requires identifying the best order for reducing durations of the individual tasks. It is the goal of this paper to introduce Schedule Path Explorer Beta version1.0 (SPE Beta v.1) as an initial step toward developing a crashing software program to be used mainly by instructors and students but also by professionals to improve the understanding of how to crash a schedule. The SPE that is a response to the issue of automatically identifying all the paths on a given network problem. Identifying the activities on each of the paths makes it possible for students to build spreadsheets and track the changes in critical or noncritical status, as the duration of certain activities are reduced based on their associated costs. a crashing and costs law in the knowledge age was studied. That study seeks to add contributions of the innovation and industrial economics to more used techniques of crashing in the projects management domain. First, it presented the brute force method, improved for the use of the MS Project. Second, it developed the models for determining the earliest crash completion time and for determining a least costly crash schedule. Third, it established costs laws, which allow inferring that the cost of a project does not depend only on the production rate but depending also on the time were the first unit of production will be available, on the global volume of production and on the project completion time. Projects management might considerably help organizations that search for a better market position, providing a higher significance to the competitive advantages to be developed by the company along the time. The simulation approach for optimization project cost and schedule was one of a variety of tools that could use to bring projects back under control and reinforce the use of project management in organizations. The use of simulation to crash project management networks in order to reduce time and cost overruns was a worth endeavor. The project manager, in collaboration with the IT division, could routinely submit each developed network to crashing (using the simulation program),the optimization of time and cost process technique could be incorporated as a standard procedure for every project was concluded, the time spent on the actual crashing was minimal and the project management schedule could be reduced to a minimum optimum level to save time and money. Márcio Botelho da Fonseca Lima, Dr. Universidade Federal da Paraíba (UFPB) Luiz Bueno da Silva, Dr.Universidade Federal da Paraíba (UFPB) Renata Jorge Vieira estranda em Engenharia de Producao [2006] presents the brute force method, improved for the use of the MS Project. Second, it develops the models for determining the earliest crash completion time and for determining a least costly crash schedule, for the same home-building project used in the brute force method. Third, it Establishes costs laws, which allow inferring that the cost of a project does not depend only on the production rate but depending also on the time were the first unit of production will be available, on the global volume of production and on the project completion time.

Conclusion:

In this paper proposed to develop software program for obtaining the resource cost requirements from a network graph of the project program was developed for network drawing and computation of resource costing profile and unit crashing reduces the cost of project as using MS EXCEL program to achieve the result.

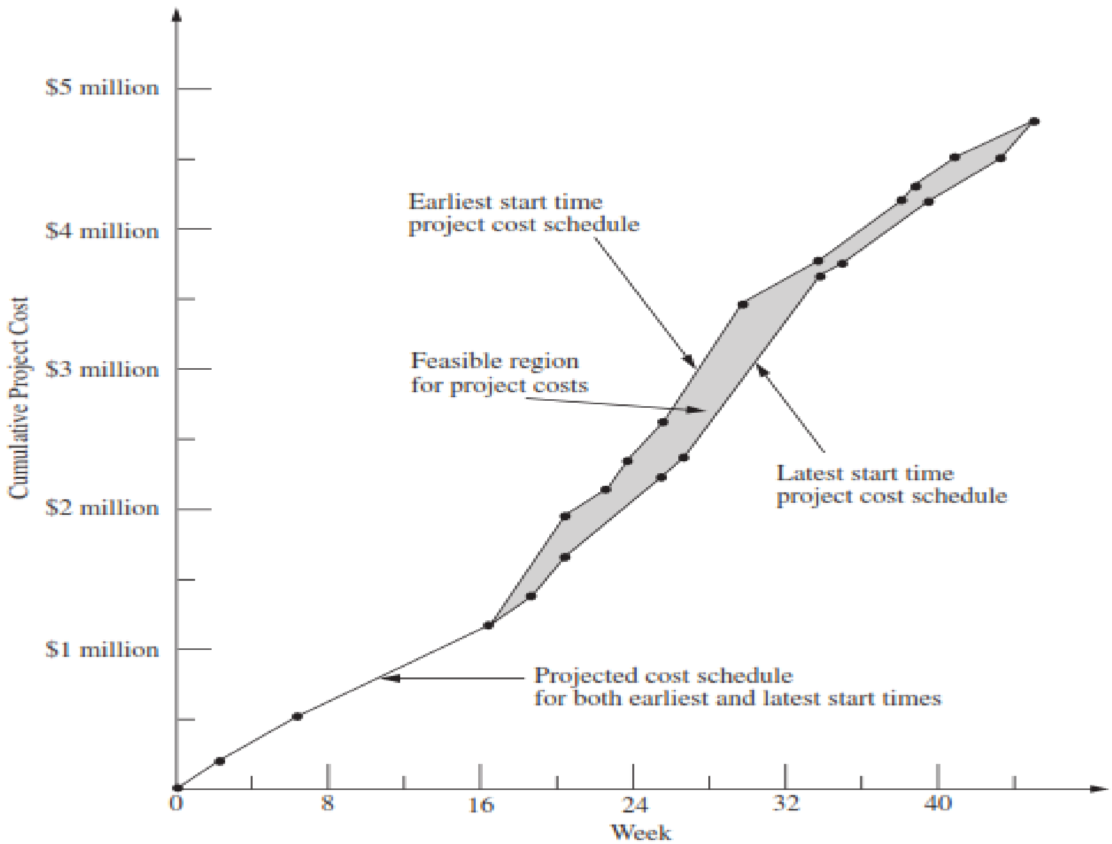


Fig no. 10

Reference:

Project Management with PERT/CPM hil61217_ch22.qxd

Kathryn, A.M., 2004. A simulation approach to the PERT/CPM: time-cost trade-off problem. Project Manage. J., 35: 31-38.

Van Slyke, R.M., 1963. Monte carlo methods and the PERT problem. Operat. Res., 33: 141-143.

Ameen, D.A., 1987. A computer assisted PERT simulation. J. Syst. Manage., 38: 6-9.

Coskun, O., 1984. Optimal probabilistic compression of PERT networks. J. Construct. Eng. Manage., 110: 437-446.

Beasley, J. (2012). *Network analysis*. Retrieved 2 22, 2012, from Brunel: http://people.brunel.ac.uk/~mastjjb/jeb/or/netanal.htm

Charts, C. P. (2012). *Project Management*. Retrieved 01 27, 2012, from mindtools: http://www.mindtools.com/critpath.html

PERT. (2012). *Business Knowledge Management*. Retrieved 2 17, 2012, from NetMBA: http://www.netmba.com/operations/project/pert/

Construction Scheduling with Primavera Project Planner by Leslie Feignbaum Publisher: Prentice Hall Managing with Microsoft Project by Lisa A. Bucki, Gary Chefetz Publisher: Premier Press Microsoft Project Bible by Elaine Marmel Publisher: Wiley Publishing, Inc.

Microsoft Project for Dummies by Nancy Stevenson Publisher: Hungry Minds, Inc.

Step by Step Microsoft Project version 2002 by Carl Chatfield, Tomothy Johnson Publisher: Microsoft Press

Adapted from an original case by Robert J. Thieraus, Margaret
Cunningham, and Melanie Blackwell, Xavier University, Cincinnati, Ohio.

Construction scheduling with Primavera enterprise 1.2 by David A. Marchman

Trouble Shooting Microsoft Project by Bonnie Biatore

Microsoft Project inside Out by Teresa S. Stover

Special edition using Microsoft Project by Tim Pyron

Construction Scheduling with Primavera Project Planner by David A. Marchman / Delmar Leaviy