Assignment: # 0 **(Fall 2010**
Mth601 (Operations Research)
Lecture: 1 – 10

Total Marks = 30
Due date: 04th November, 2010
INSTRUCTIONS

Please read the following instructions before attempting to solve this assignment

1. In order to attempt this assignment you should have full command on

   Lecture # 01 to Lecture # 10

2. In order to solve this assignment you have strong concepts about following topics

   - ✓ Concept of Network.
   - ✓ Rules for construction of Network.
   - ✓ CPM / PERT.
   - ✓ Floats.

1. Try to get the concepts, consolidate your concepts and ideas from these questions which you learn in Lecture # 01 to Lecture # 10.
2. You should concern recommended books for clarify your concepts as handouts are not sufficient.
3. Try to make solution by yourself and protect your work from other students. If we found the solution files of some students are same then we will reward **zero** marks to all those students.
4. You are supposed to submit your assignment in **Word format** any other formats like scan images, PDF format etc will not be accepted and we will give **zero** marks to these assignments.

Assignments through **e-mail** are not acceptable after due date (If there is any problem in submitting your assignment through LMS, you can send your solution file through email with in due date). ***You are advised to upload your assignment at least two days before Due date.***

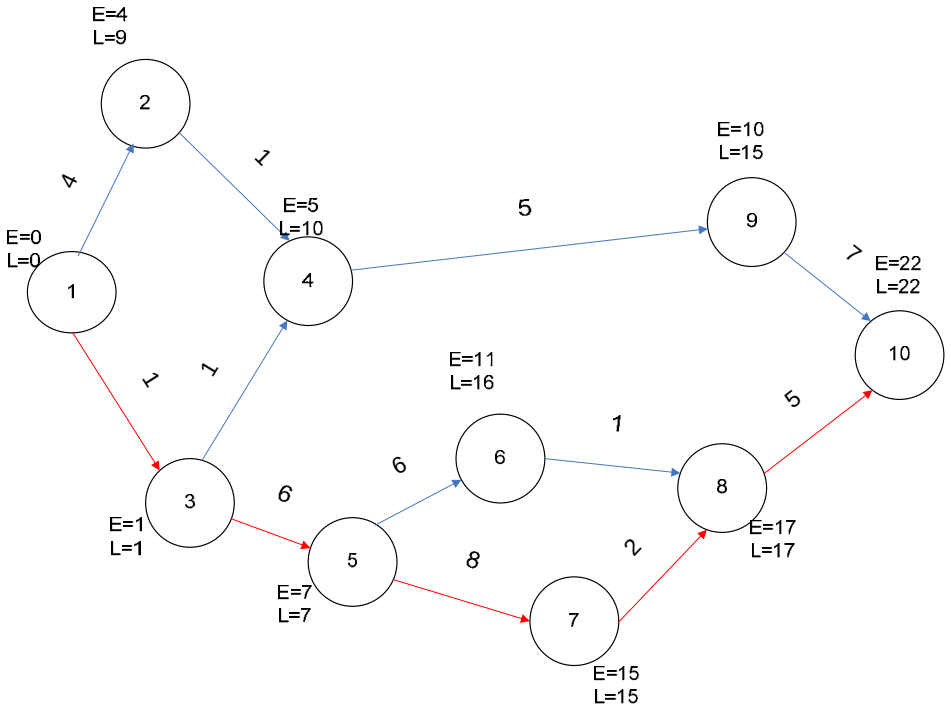
Qno: 01:

The characteristics of a project schedule are as follows;

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time(weeks)	4	1	1	1	6	5	4	8	1	2	5	7

I) Construct the netwok diagram.
II) Compute start and finish(earliest and latest for both) for each event
III) Find the critical path.

Solution:



In forward pass computations;

$E_1=0$

$E_2=E_1+t_{12}=0+4=4$

$E_3=E_1+t_{13}=0+1=1$

$E_4=Max(E_2+t_{24},E_3+t_{34})=Max(4+1,1+1)=5$

$E_5=E_3+t_{35}=1+6=7$

$E_6=E_5+t_{56}=7+4=11$

$E_7=E_5+_{t57}=7+8=15$

$E_8= Max(E_6+t_{68},E_7+t_{78})=Max(11+1,15+2)=17$

$E_9=E_4+t_{49}=5+5=10$

$E_{10}= Max(E_8+t_{810},E_9+t_{910})=Max(17+5,10+7)=22$

In backward pass computations;

$L_{10}=E_{10}=22$

$L_9=L_{10}-t_{910}=22-7=15$

$L_8=L_{10}-t_{810}=22-5=17$

$L_7=L_8-t_{78}=17-2=15$

$L_6=L_8-t_{68}=17-1=16$

L_5=Min(L_6-t_{56},L_7-t_{57})=Min(16-4,15-8)=7
L_4=L_9-t_{49}=15-5=10
L_3= Min(L_4-t_{34},L_5-t_{35})=Min(10-1,7-6)=1
L_2=L_4-t_{24}=10-1=9
L_1= Min(L_2-t_{12},L_3-t_{13})=Min(9-4,0-0)=0

Activity	Duration	Start Time (Earliest,Start)	Finish Time (Earliest,Start)	Total Float
1-2	4	(0,5)	(4,9)	5
1-3	1	(0,0)	(1,1)	0
2-4	1	(4,9)	(5,10)	5
3-4	1	(1,9)	(2,10)	8
3-5	6	(1,1)	(7,7)	0
4-9	5	(5,10)	(10,15)	5
5-6	4	(7,12)	(11,16)	5
5-7	8	(7,7)	(15,15)	0
6-8	1	(11,16)	(12,17)	5
7-8	2	(15,15)	(17,17)	0
8-10	5	(17,17)	(22,22)	0
9-10	7	(10,15)	(17,22)	5

Path $1 \rightarrow 3 \rightarrow 5 \rightarrow 7 \rightarrow 8 \rightarrow 10$ with project duration of ***1+8+8+2+5 = 22*** weeks is the critical path.

Qno:02:

For a project three times **t_0, t_m,t_p** are given as

Activity	**t_0, t_m,t_p**	Activity	**t_0, t_m,t_p**
1-2	4,8,12	5-7	3,6,9
2-3	1,4,7	5-8	4,6,8
2-4	8,12,16	6-10	4,6,8
3-5	3,5,7	7-9	4,8,12
4-5	0,0,0	8-9	2,5,8
4-6	3,6,9	9-10	4,10,16

with the following constraints;

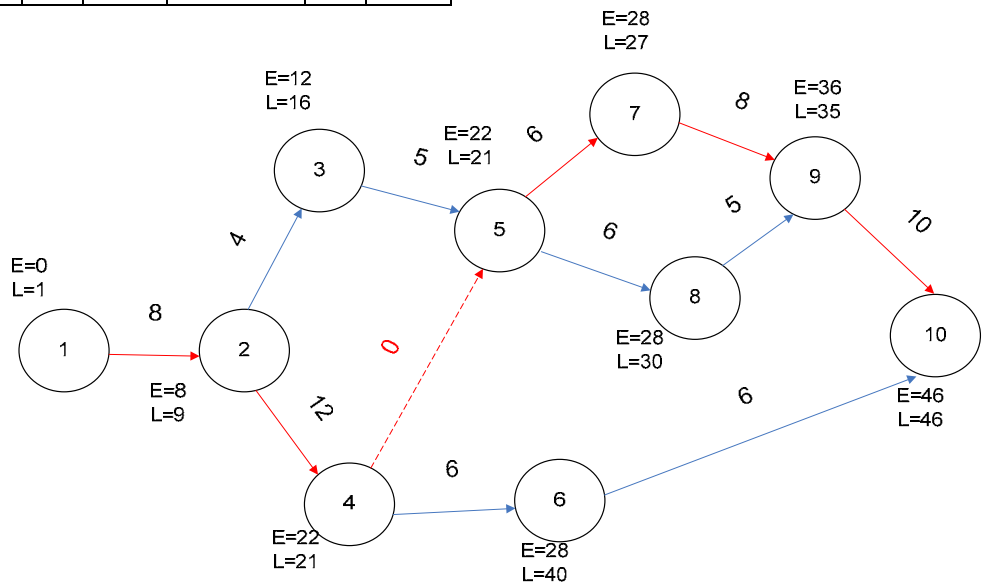
i) completion time of scheduled project is 46-days
ii) Activity 7-9 must end in least 35 days
iii) After 22 days, activity 4-5 will be started

Then draw the network diagram and determine the critical path. Also find the probability of completing the project in scheduled time.

Solution:

The expected times and the variances of the activities are given below, while network for the given data is shown in figure. The expected activity times are written along the activity arrows.

Activity	t_e	σ^2	Activity	t_e	σ^2
1-2	8	1.77	5-7	6	1.00
2-3	4	1.00	5-8	6	0.44
2-4	12	1.77	6-10	6	0.44
3-5	5	0.44	7-9	8	1.77
4-5	0	0.00	8-9	5	1.00
4-6	6	1.00	9-10	10	4.00



In this problem, the earliest start time of 4-5 which is dummy activity is 22 days. In other words the earliest occurrence time of event 40 is 22.
35 days is given latest time to complete the activity 7-9.

Here the computations of earliest and latest times are carried by the forward and backward pass computations.Events 4,5,7, and 9 have slacks of "-1" days, so the activities 4-5, 5-7 and 7-9 are thus most ctitical.Event 10 has zero slack, while events "1" and "2" have a positive slack of 1 day each. Thus the path

$1 \rightarrow 2 \rightarrow 4 \rightarrow 5 \rightarrow 7 \rightarrow 9 \rightarrow 10$

is the critical path of this network.

Since the scheduled completion time of the project is the same as the expected completion time, probability of completion time of the project is the same as the expected time, so the probability of completion time is 50%.