Tutorial letter 203/2/2016

Software Project Management

INF3708

Semester 2

School of Computing

IMPORTANT INFORMATION:

This provides the solutions to INF3708 assignment 03 for semester 2.

Questions on Chapter 6 -Activity Planning

QUESTION 1 **[45]**

1.1 Consider the following list of tasks with dependencies and estimated durations reflected in the table. Draw a CPM network (activity-on-arrow diagram) to illustrate the interaction of activities. (9)

Task	Precedents	Duration (weeks)
A	None	5
B	None	7
C	B	16
D	B	7
E	A	6
F	A	9
G	D, E	10
H	F,G	8

Table 1 for Question 1

1.2 Write down the critical path using the letters of the tasks and calculate and write down the duration of the project. How many paths are there in total? Identify them all and write them down. (3)

1.3 What will the effect on the project be if the duration of activity A changes to 8 weeks? (1)

1.4 Due to the advent of new technology the following changes will occur:

- Task A duration changes to 6 weeks
- Task G duration changes to 5 weeks
- Task Cis no longer dependent on the completion of Task B
- Task C duration changes to 28 weeks

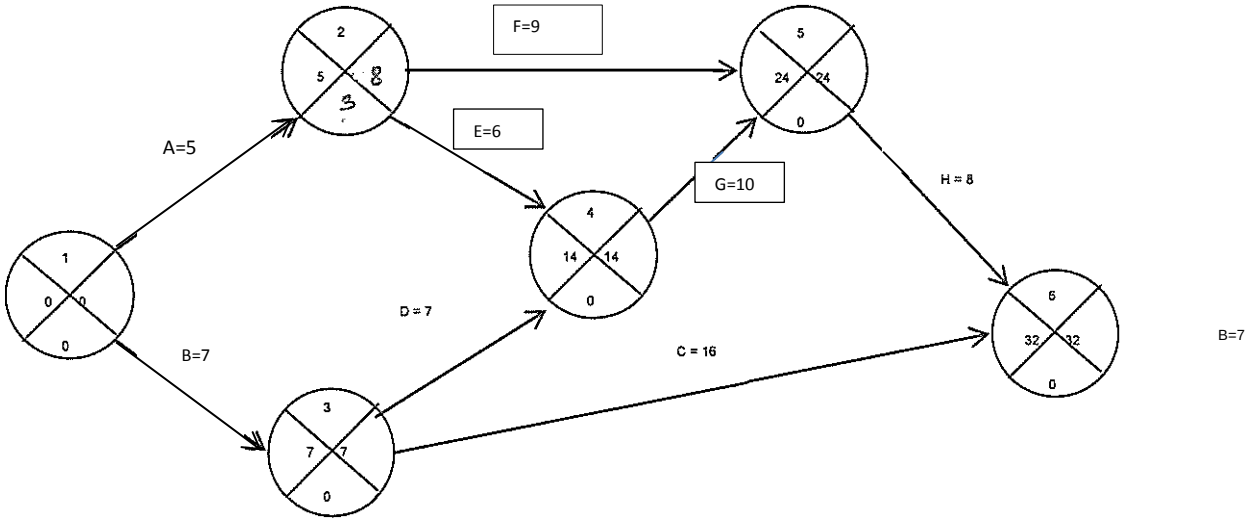
Draw the activity-on-node network (precedence network) diagram for the tasks as given in the table, incorporating these changes. Indicate **all** the node values on the nodes. Indicate the critical path with a* on each task in the path (1'6)

1.5 Calculate the earliest start time, earliest finish, latest start time, latest finish and total float of the tasks for the activity-on-node network (precedence network diagram drawn in Question 1.4. Give your answer in table format. (10)

1.6 Summarise the overall effect of the changes in 4 compared to the scenario in 1 and indicate whether the change in technology should be implemented or not.

ANSWERS

1.1



1.2 Write down the critical path using the letters of the tasks and calculate and write down the duration of the project. How many paths are there in total? Identify them all and write them down. **(3)**

Critical path: ***B****-D-G-H*

Project duration: 32 weeks

Number of paths: *4 paths, namely:*

A-F-H

A-E-G-H

B-D-G-H

B-C

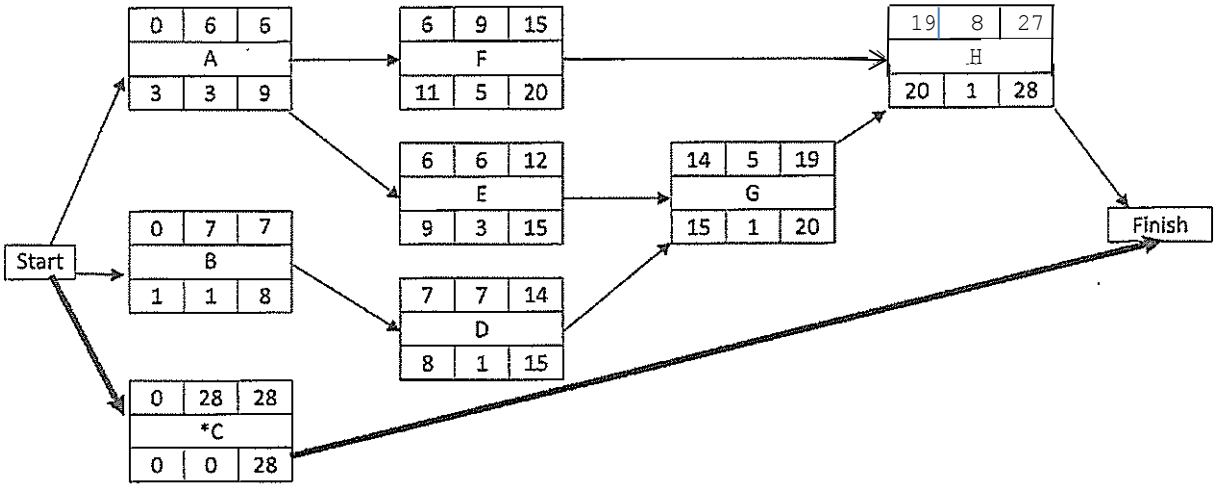
1.3 What will the effect on the project be if the duration of activity A changes to 8 weeks? **(1)**

Duration still 32 weeks, but now two critical paths: A-E-G-H and B-D-G-H

1.4 Due to the advent of new technology the following changes will occur:

- Task A duration changes to 6 weeks
- Task G duration changes to 5 weeks
- Task C is no longer dependent on the completion of Task **B**
- Task C duration changes to 28 weeks

Draw the activity-on-node network (precedence network) diagram to incorporate these changes, indicating all the node values. Indicate the critical path with a * on each task in the path. (16)



*2 marks for each node with all information (as changed), (2*8=16), one mark for start and end node.*

Note: the node labelling should reflect the current labelling convention (see pg. 144)

1.5 Calculate the earliest start time, earliest finish, latest start time, latest finish and total float of the tasks for the activity-on-node network (precedence network diagram) drawn in Question 1.4. Give your answer in table format. (10)

Task	*Duration (weeks)*	*Earliest Start*	*Earliest Finish*	*Latest Start*	*Latest Finish*	*Float*
A	*6*	*0*	*6*	*3*	*9*	*3*
B	*7*	*0*	*7*	*1*	*8*	*1*
C	*28*	*0*	*28*	*0*	*28*	*0*
O	*7*	*7*	*14*	*8*	*15*	*1*
E	*6*	*6*	*12*	*9*	*15*	*3*
F	*9*	*6*	*15*	*11*	*20*	*5*
G	*5*	*14*	*19*	*15*	*20*	*1*
H	*8*	*19*	*27*	*20*	*28*	*1*

*Maximum 2 marks were given for each column if **all** the values are correct, with Y, mark subtracted for each incorrect value in a column to a maximum of 2, giving a total of 10 marks.*

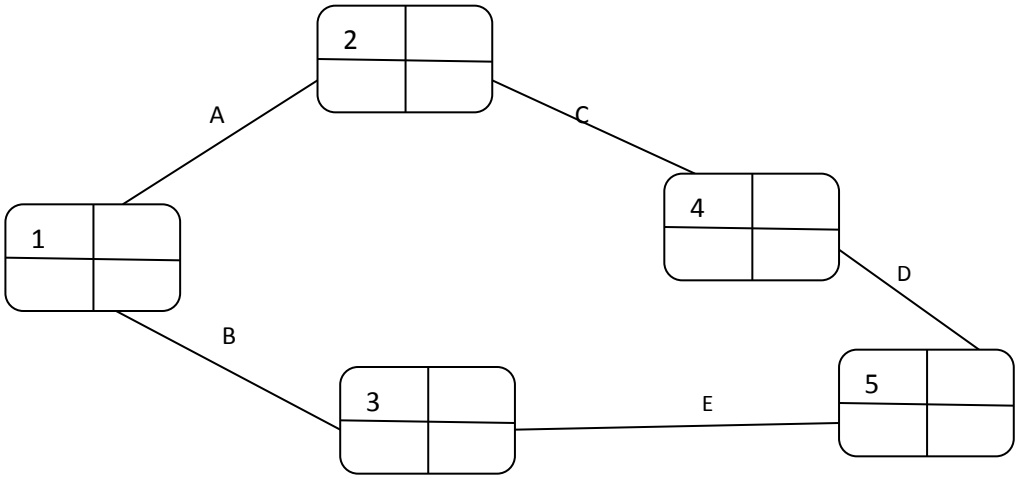
1.6 Summarise the overall effect of the changes in 1.4 compared to the scenario in 1.1 and indicate whether the change in technology should be implemented or not. (6)

Critical path:	*Changes from B-D-G-H to C*
Project duration:	*Decreases from 32 weeks to 28 weeks*
Decision:	*The change in technology should be implemented since the overall duration of the project* is *decreased by 4 weeks.*

Questions on Chapter 7 - Risk Management

QUESTION 2 **[15]**

In the PERT network illustrated in the figure below, the target date for the completion of the project is 15 weeks.



Pert network for Question 2

	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Expected (te)	Standard Deviation (s)
A	4	6	8		
B	1	4	5		
C	2	3	5		
D	2	5	6		
E	3	4	5		

Table for Question 2

Use the table above to calculate the following:

2.1 Calculate the Expected (!e) values and Standard Deviation (s) and indicate the (te) and (s) values on the diagram. (10)

2.2 Calculate the Z value on the last event. (3)

2.3 According to Figure 7.8 (p.181) in your textbook, what is the probability of not meeting the target date? (2)

Discussion of Question 2

2.1 Calculate the Expected (te) values and Standard Deviation **(s)** and indicate the (4) and **(s)** values on the diagram. (10)

Use the formula below to calculate the te values of each activity:

$$\frac{a+4m+b}{6}$$

*Calculating the te value of Activity A: te = (4+(4*6)+8)/6 = 36/6 = 6*

*Calculating the te value of Activity B: te = (1+(4*4)+5)16 = 22/6 = 3.67*

*Calculating the te value of Activity C: te = (2+(4*3)+5)16 = 1916 = 3.17*

*Calculating the te value of Activity D: te = (2+(4*5)+6)16 = 2816 = 4.67*

*Calculating the te value of Activity E: ie = (3+(4*4)+5)16 = 2416 = 4*

Use the formula below to calculate the **s** values of each activity:

$$s = \frac{b - a}{6}$$

Calculating the s value of Activity A: s = (8-4)16 = 4/6 = 0.67

Calculating the s value of Activity B: s = (5-1)16 = 416 = 0.67

Calculating the s value of Activity C: s = (5-2)16 = 3/6 = 0.5

Calculating the s value of Activity D: s = (6-2)16 = 416 = 0.67

Calculating the s value of Activity E: s = (5-3)16 = 2/6 = 0.33

The **sd** *for event 2* is *the* **s** *value for Activity A, i.e. = 0.67*

The **sd** *for event 3* is *the* **s** *value for Activity 8, i.e. = 0.67*

The **sd** *for event 4* is *total SO of A* + C

= *(sd of event 2)'* + (s *of Activity C)')*

= $0.67^2 + 0.5^2$)

= *0.694444444)*

=0.83

The **sd** *for event 5 there are two possible routes: A* + C + *E and B* + *D, calculate both, then take the longest route*

sdforA + C + D = $0.67^2 + 0.5^2 + 0.67^2$)

= *1.1478)*

= *1.07*

sdforB + *D* = $0.67^2 + 0.33^2$)

= *0.5578)*

= *0.75*

The biggest* is *1.07

The te and s values calculated above are depicted in the figure below:

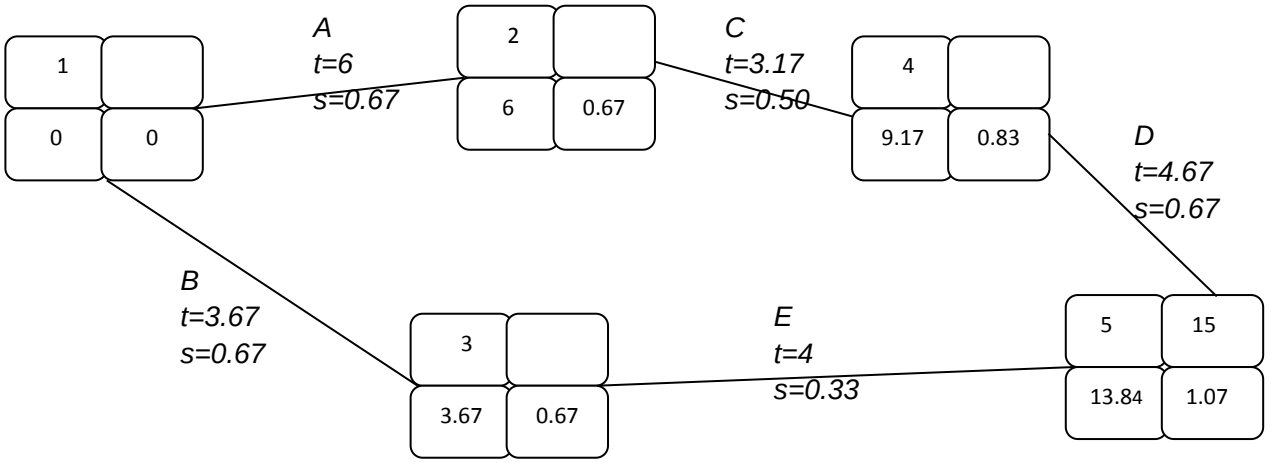


Diagram 1: The Pert network

In the table below find a summary of the calculations:

	Optimistic (a)	*Most Likely (m)*	*Pessimistic (b)*	*Values*	*Expected (te)*	*Values*	*Standard Deviation (s)*
A	*4*	*6*	*8*	*-(4+(4*6)+8)/6*	*6.00*	*-(8-4)/6*	*0.67*
B	*1*	*4*	5	*-(1+(4*4)+5)/6*	*3.67*	*-(5-1)/6*	*0.67*
C	*2*	*3*	5	*-(2+(4*3)+5)/6*	*3.17*	*-(5-2)/6*	*0.50*
D	*2*	5	*6*	*-(2+(4*5)+6)/6*	*4.67*	*-(6-2)16*	*0.67*
E	*3*	*4*	5	*-(3+(4*4)+5)/6*	*4.00*	*-(5-3)16*	*0.33*

Table 1: Pert network calculatiOns

2.2 Calculate the Z value on the last event. (3)

Use the formula below to calculate the Z value for last activity:

$$Z = \frac{T - te}{s}$$

$Z = (15\text{-}13.84)11.07$

$= 1.084112$

2.3 According to figure 7.8 (p.181) in your textbook, what is the probability of not meeting the target date? (2)

The probability of not meeting the target date is approximately 17%. This value was derived from figure 7.8, using the Z value of 1.08 (that was calculated above) as input on the X- axis. The Probability Value can then be read from the Y-axis. Any value from 15% to 18% is acceptable because it is not easy to pinpoint the precise value from the graph. See A on the figure below.