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Operations Management Made Easy.

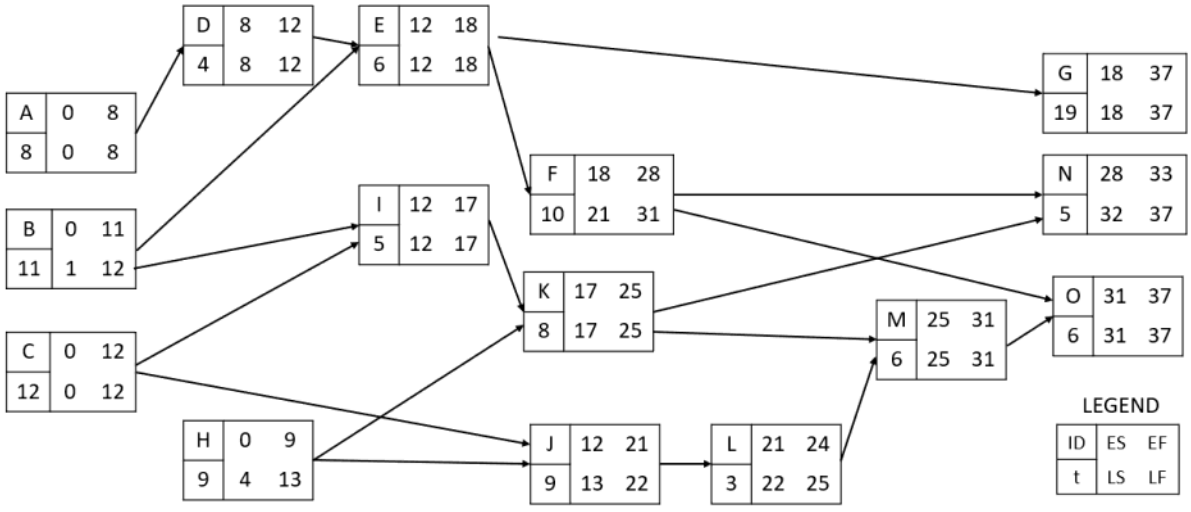
Midterm 1 Preview
1 Question Per Topic

Crashing

York University is considering to expand the student residence. Relevant information about the project is included in the following table:

Activity	Normal Time (Weeks)	Maximum # of week/s Activity may be shortened	Normal Cost ($)	Crash Cost Per Week ($)
A	8	1	11115	1690
B	11	1	24320	2005
C	12	1	21650	1710
D	4	2	6925	1935
E	6	1	13605	3975
F	10	6	11280	990
G	19	1	37840	1565
H	9	4	6855	620
I	5	2	12580	1945
J	9	3	21600	2320
K	8	1	16435	1895
L	3	1	7185	2100
M	6	1	9050	1825
N	5	2	3325	510
O	6	2	12380	4250

Network is constructed below according to the normal time.



A) It turns out that due to a revised priority requirement of York University, they need the project to be expedited by three weeks as compared to its normal completion time. Crash the project by 3 weeks. Please fill in a table with column headers given below completely.

Trial #	Critical Path/s	Completion Time Before Crashing	Activity/ies To Be Crashed	Crash Cost

B) How much would it cost to crash the project by 3 weeks, and how much will it cost to complete the project when it is shortened by three weeks?

Line Balancing

Quick Graphic Chip Company (QGCC) is setting up a process to manufacture video graphic chips. QGCC runs single shift daily. Total duration of the shift is 8.25 hours long, in which there are two breaks of 15 minutes each, which are not productive hours. Demand for completed products is 375 units daily. The process of making these chips is broken down into 13 work elements (tasks) and is to be organized as an assembly line. The precedence relationships and time requirements for each element are as follows:

TASK	TIME (seconds)	TASK THAT MUST PRECEDE
A	36	-
B	39	-
C	38	A
D	31	B
E	37.5	A
F	39	-
G	32.5	B, F
H	36	D, G
I	37.5	C, G
J	25.5	E, I
K	42	I
L	26	H, K
M	48	J, L

A) Draw a schematic diagram for the process

B) What should the workstation cycle time be in the assembly line to meet the daily demand?

C) What is the theoretical minimum number of workstations required to meet the daily demand?

D) Balance the line with the minimum number of stations to meet the demand. What is the percentage of total idle time across the entire assembly line? Use the following rules:
Primary rule: Largest task time
Secondary rule for breaking ties: Largest number of following tasks
If secondary rule is not successful in breaking the tie, use alphabetical order as your second tie-breaking rule.

Fill in a table with the column headers given below for part D.

Work Station	**Feasible Tasks**	**Task Selected**	**Selected Task Time (secs)**	**Remaining cycle time (sec)**	**Is the Secondary Rule applied? Yes/No**

PERT/CPM

Chimney Solar Energy Installation CSEI is owned by Martha. She is very concerned with the amount of time it took to complete several recent jobs. Some of her workers are very unreliable with respect to time. A list of activities and their optimistic completion time (a), the most likely completion time (m) and the pessimistic completion time (b) for a new contract are determined. Based on the assumption that the activity times follow a beta distribution, the expected activity time and the standard deviation of each activity are calculated for you and given in the table below:

Activity	Immediate Predecessor(s)	Expected Time (Days)	Standard Deviation
A	None	7	1.3333
B	None	4	0.6667
C	B	5	2.0000
D	None	10	4.0000
E	A, D	3	0.3333
F	A	2	0.6667
G	D, F	5	0.0000
H	C, F	6	0.8333
I	E	13	6.0000
J	B, E	4	0.6667
K	G, J	9	5.0000
L	H, J	8	2.1667

A) Construct a network diagram and determine ES, EF, LS, LF and slack for each activity.

B) Determine the expected project completion time and the critical path(s)

C) What is the probability that CSEI will take more than 25 days to complete the project?

D) What is the probability that KHC will take more than 29 days but less than 36 days to complete the project?

E) If Martha wants to complete the project with a 95.48% assurance, how many days from the due date should she need start the project? You can leave your answer in decimals.