ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2017 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

14-IN-A4 PRODUCTION MANAGEMENT

Total of 50 points with 6 exercises.

If nothing is stated, justify your answer.

If you lack data, make clear, consistent and credible assumptions about the missing data and work with these assumptions.

Exercice 1 (10 Points):

Let consider the following set of tasks :

Task	Direct Successors	Standard duration	Minimum duration	Cost for all day reduction
A	E,D	3	2	1100 $
B		3	2	1000 $
C	D,G	2	1	500 $
D	F	4	2	1200$
E	K	2	1	600 $
F	H,I,J,K	6		1300 $
G	H	1		800 $
H	M	6	4	200 $
I	L	3		250 $
J	L	7		1000 $
K	B	5		
L		4	4	--
M		4		800 $

Question 1 (3 points):

Draw the task graph by putting the tasks on the arcs:

Question 2 (4 points):

Draw the graph by placing the tasks on the nodes. On each node, give the earliest start date, the starting date at the latest and the margin. Give the critical path.

Question 3 (3 points):

We have a budget of $ 2,500 to accelerate the project. Explain your strategy and the tasks you want to shorten to reduce the initial duration of two days.

Exercise 2 (10 points):

One company uses a cold striking machine to make a family of 5 different product types. The adjustment to change the product type requires a mold change and a focus. Each settup takes 2 hours and uses a trimmer at an estimated cost of $ 45 per hour. The machine cost is estimated at $ 120 per hour (depreciation and consumables).

	Production rate (units/mn)	Demand per month	Row material ($ per units)	Hours per month	Total cost per units
A	5	5000	0,2		
B	5	10000	0,2		
C	10	10000	0,2		
D	10	5000	0,2		
E	5	8000	0,5		

The company estimates that the storage cost is 30% of the cost of the product per year (raw material and machining time).

Question 1 (4 points):

Considering that the cost of ordering is the total setup cost, plus time machine adjuster, give the economic quantities of orders and the replenishment period.

	Total Cost per unit	Economic Order Quantity	Économic Period T* (Months)
A			
B			
C			
D			
E			

Question 2 (1 point) :

Considering the required production and the settings, give the total time of use of the machine in a month.

Question 3 (4 point) :

Considering that the machine is not saturated and that the ordering cost should simply be reduced to the cost of the adjusters, give the new economic quantities:

	Total Cost per unit	Economic Order Quantity	Économic Period T* (Months)
A			
B			
C			
D			
E			

Question 4 (1 point):

What is your proposal for replenishing products A, B, C, D and E.

Exercice 3 (7 points):

A company makes a sales history over the past 12 months:

month	1	2	3	4	5	6	7	8	9	10	11	12
demand	153	215	131	274	209	272	192	256	253	329	194	299

It decides to make a forecast for the next 3 months.

Question 1 (3 points):

We decide to make a prediction by exponential smoothing of coefficient alpha = 0.2: Give for each month the smoothed value of the demand, identify the model.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Demand	153	215	131	274	209	272	192	256	253	329	194	299
Smoothed value												

Question 2 (4 points):

Provide forecasts for the next 3 months.

Month	7	8	9	10	11	12	1	2	3
Demand	192	256	253	329	194	299			
Smoothed value									
Prévision									

Exercice 4 (5 points):

A job ordering company on two machines. This is a two-machine flow shop (jobs A to I)
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	A	B	C	D	E	F	G	H	I
M1	7	2	5	5	4	3	5	5	6
M2	3	4	4	6	4	4	9	3	5

Question 1 :

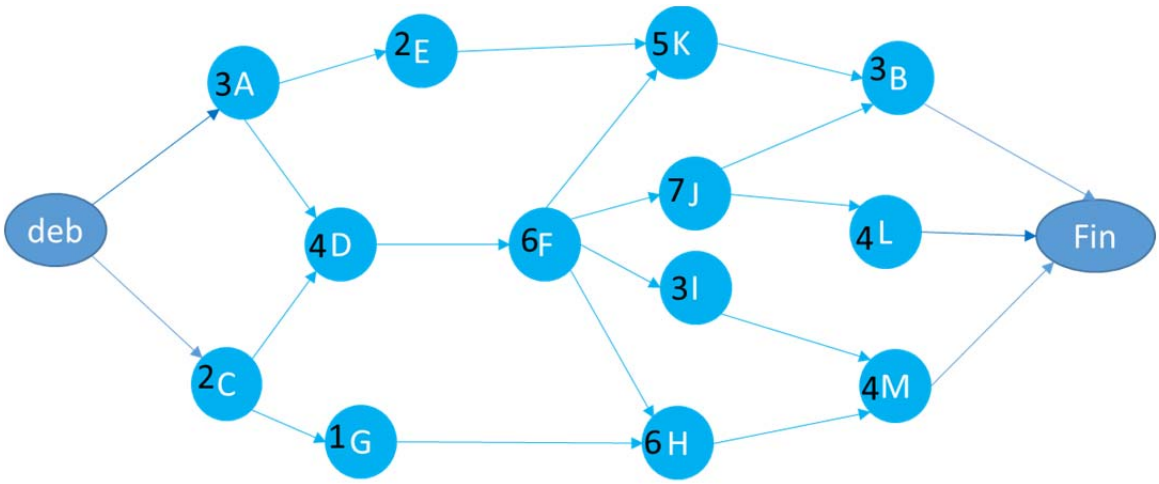
Order jobs in the order of the Johnson algorithm. Give the Cmax of this schedule.

Rang	1	2	3	4	5	6	7	8	9
Jobs									
Date fin sur M2									

Cmax :

Exercice 5 (8 points):

A company works in product assembly. The assembly graph is the following :



Duration in black in the node (Task A, duration 3)

Question 1 (4 points) :

It is desired to produce an assembly line with a maximum cycle time of 11 time units. Propose a balanced line using the method of the greatest candidate. Give the efficiency factor of this line.

Efficiency factor:

Question 2 (4 points):

It is desired to produce an assembly line with a maximum cycle time of 9 time units. Propose a balanced line using the method of the greatest candidate. Give the efficiency factor of this line.

Efficiency factor:

Exercice 6 (10 points):

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MRP means Management Resource Planning		
ERP is a scheduling priority rule		
The production master schedule gives forecasts of the needs of finished products (or types of products)		
Gross requirements take into account on hand inventories		
Dependant Requirements are the needs for finished products		
When we think that the consumption model follows a seasonal pattern, if we want to filter the data, we first have to seasonally adjust them.		
In project management, the PERT method allows to give an exact value of the duration of the project		
KANBAN method is a push method		
The two main levers of production planning are making stock and capacity adjustment.		
We have the right to consume security stocks		